

# GREEN INFRASTRUCTURE POLICY INTEGRATION IN PUGET SOUND MUNICIPALITIES

## *AN ETHNOGRAPHIC PERSPECTIVE*

**A TECHNICAL MEMORANDUM FOR THE PUGET SOUND PARTNERSHIP**

PUGET SOUND PARTNERSHIP TECHNICAL REPORT 2015-02 | AUGUST 2015



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## About the LEAF School

The mission of the Learn and Serve Environmental Anthropology Field (LEAF) School at Edmonds Community College is to engage college students in the community through hands-on service-learning and community-based research projects. We partner with non-profits, tribes, municipalities, state, and federal agencies on projects that apply traditional knowledge and anthropological methods to efforts to make our communities more sustainable. Anchored by a series of field-based courses in human ecology and archaeology, the LEAF School employs an indigenous pedagogy that includes peer mentoring and community-engagement to facilitate on-going research and activities by introductory-level students. The LEAF School's reciprocal approach to participant observation engages students and faculty in cultural activities through collaboratively designed service-learning and research projects that address community-identified needs. More information is available at [www.edcc.edu/leaf](http://www.edcc.edu/leaf).

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## Executive Summary

Recovery of the Puget Sound is more than a scientific and technological endeavor. Sustainable solutions require attention to human factors that contributed to the current situation and that may slow or accelerate efforts to achieve a balanced and healthy ecosystem. Various behaviors, structures, processes, and practices in local governments, for example, may impede the implementation of the Puget Sound Action Agenda. Developed by the Puget Sound Partnership, a Washington state agency charged with coordinating Puget Sound recovery efforts, the Action Agenda sets priorities for Puget Sound recovery at local and regional levels.

This rapid ethnographic assessment uses a literature review, participant observation, interviews, focus groups, mapping exercises, public document analysis, and an online survey to reveal an insider's view of barriers within municipal governments to the implementation of Action Agenda priorities related to green infrastructure in the twelve county Puget Sound region in Washington State. These mixed-methods have identified patterns in the perception of barriers in local governments to implementation of green infrastructure and their variability across jurisdictions of different sizes, between cities and counties, across programs (e.g. planning, permitting, public works, natural resources, etc.) and staff hierarchies within municipal governments.

This line of inquiry is intended to both improve the function of local government and to enhance regional capacity to implement the Puget Sound Action Agenda, specifically with regard to stormwater management, including water quality and flow; recovery of threatened and endangered species; habitat; low-impact development; and management of freshwater and marine shorelines. Its ultimate purpose is to inform and identify systemic actions that may be taken to improve our collective ability to solve complex societal problems.

Persistent barriers to the implementation of green infrastructure in the Puget Sound region emerged across all methods of analysis. Maintenance of green infrastructure, especially when public agencies need to ensure that maintenance is occurring on private property, appears as the most difficult challenge faced by municipal employees in this region. Uncertainties in cost and performance increase risk and liability and drive up project costs, posing another widely recognized barrier. The challenge of retrofitting legacy infrastructure appears persistently across all methods of analysis. Communication across municipal divisions, especially those dividing public works from planning and community development, can be challenging for many municipalities, especially larger ones who are Phase I permittees. Addressing maintenance issues, uncertainties in cost and performance, risk and liability, project costs, legacy infrastructure, and interdepartmental communication are major hurdles to overcome.

Widely proposed solutions to these and other problems appear across each different method of analysis. Reduction of risk and uncertainty with cost, benefit, and performance analyses and making developers responsible for environmental damage through better enforcement are widely desired actions. Municipal employees desire better internal and external communication and would like to see more grants and other financial assistance, especially for retrofitting legacy infrastructure but also for staff, training, and green infrastructure projects. They report that reducing risk and uncertainty, increasing accountability and grants, and site specific designs that consider stormwater at the outset of a project can help remove barriers. An ecosystems services approach to municipal and project accounting may help reduce perceptions of higher costs.



## Highlights

- Maintenance, especially when public agencies need to ensure that it is occurring on private property, is the most persistent barrier to green infrastructure implementation.
- Uncertainties in cost and performance increase risk and liability and drive up project costs, posing another widely recognized barrier.
- Legacy infrastructure and the suitability of some soils to infiltration are reported to be common barriers across all methods of analysis.
- Implementation of green infrastructure occurs within a context of conflicting priorities such as protecting human safety and cultural resources, and access for emergency, solid waste, disability, and parking. These varied priorities are reflected in conflicting codes, mandates, and regulations that municipalities are engaged in removing.
- Reports of physical, technical, legal, and regulatory barriers appear to be decreasing over time relative to financial and community and institutional barriers which may be rising more to the forefront as municipalities address technical and regulatory barriers.
- Reduction of risk and uncertainty with cost, benefit, and performance analysis, making developers responsible for environmental damage, and better enforcement are widely desired.
- Municipal staff would like to see more grants and other financial support, especially for retrofitting legacy infrastructure but also for staff, training, and green infrastructure projects.
- Considering stormwater at the outset of a project and incorporating LID techniques appropriate to a site's soils and water are broadly desirable solutions to concerns about soil suitability.
- Insufficient enforcement of codes and regulations and not holding developers accountable for environmental damage are more persistent barriers in counties than in cities.
- Insufficient enforcement is more of a barrier in jurisdictions that include rural areas versus those serving only urban areas.
- Coordination with other jurisdictions and the fragmentation of responsibilities are more frequent problems in municipalities that serve both urban and rural areas than in ones that serve just urban or just rural constituencies.
- Conflicting priorities across municipal divisions plague very large, large, and medium-sized municipalities much more so than small ones.
- Soil suitability for infiltration is perceived as more of a barrier for Phase I than Phase II and non-permitted jurisdictions.
- Line staff were much more likely to view municipal staff resistance to change as a barrier than were middle and executive management.
- Executive and line staff reported fragmented jurisdictions and responsibilities, management vision and priorities, and unequal ability of some social groups to access incentives as larger barriers than do middle management.
- County staff found more frequent inspections of stormwater facilities to be a more helpful solution than did city staff.
- Very large and large jurisdictions found expedited permits to be more helpful than in medium or small ones.
- Phase I and Phase II permittees found local education and behavior change efforts more helpful than did non-permitted municipalities.



- Line staff found maintenance training for private property holders to be more helpful than did executive or middle management.
- Staff in natural resources and executive offices view using LID designs that do not require infiltration as more helpful than employees in other departments.
- Incentives for retrofits of existing infrastructure are most appealing to staff in education and outreach and natural resources.
- While all departments valued bringing staff together to address communication challenges, staff in parks, roads, and natural resources viewed this interdepartmental communication as the most helpful.
- Local education and behavior change efforts were most appealing to staff in education and outreach and natural resources.
- County staff found more value than city staff in lifetime maintenance cost and performance analyses, holding developers accountable for environmental damage, more regulatory flexibility when the spirit of the law is being met, and the development of best practices for LID in agricultural settings.
- Staff from municipalities with rural constituencies found development of best practices for LID in agricultural settings significantly more helpful than those from exclusively urban areas.
- Large jurisdictions found green certification programs, inter-jurisdictional collaboration, and region-wide education and behavior change efforts more helpful than other municipalities.
- Most green infrastructure functions are concentrated in public works, community development, and planning divisions of municipal governments.
- Responsibility for water quality, stormwater, and LID is concentrated in public works and shoreline master programs are typically in planning and community development while responsibility for endangered species and habitat is more equitably dispersed between public works and community and development planning.
- Silos are apparent in municipal governments with some of the largest communication gaps between line and executive staff and between employees in public works and those engaged in planning and community development. These communication challenges are greatest in counties and Phase I permittees.
- Ineffective communication is reported most consistently by line staff, while executive staff and middle management paint much rosier images of communication. The biggest differences in perception between executive and line staff is concentrated in the effectiveness of communication involving planning, permitting, and community development.
- Barriers to implementing green infrastructure appear more frequently in permitting, planning, community development, municipal management, and elected officials than elsewhere.
- Municipal staff view governmental reorganization as the least helpful internal change that might be applied while efforts to improve communication are viewed much more favorably and broadly across and within municipal governments.
- An ecosystem services approach that integrates ecology and economics into municipal and infrastructure project accounting is one of the least adopted and most promising approaches to addressing concerns about cost and providing municipal employees with tools for protecting the functionality of ecosystems upon which human well-being depends.

## Research Questions

1. What are the perceptions held by municipal employees of barriers to implementation of Low Impact Development (LID) standards?
2. What are the perceptions of barriers to implementation of LID in municipal operations (e.g., right-of-way [ROW] management)?
3. What are the perceptions of barriers to municipal Shoreline Master Program (SMP) implementation?
4. What are the perceptions of barriers to comprehensive approaches to green infrastructure?
5. How and where are stormwater management, endangered species, habitat, water quality, shoreline master program, and low impact development activities housed in municipal organizations? How effective are those divisions?
6. Where in municipal operations do potential projects encounter barriers?
7. What internal changes might remove those barriers?
8. What kinds of external support could remove those barriers?
9. How do the perceptions of barriers compare and contrast between cities and counties? Between large, mid-sized, and small jurisdictions? Between urban and rural jurisdictions? Between stormwater permittees and non-permittees?
10. How do perceptions of barriers vary between executive staff, middle managers, and line staff?
11. How do perceptions of barriers vary between staff in planning, permitting, public works, stormwater, and natural resources?

## Literature Review Summary

An accompanying literature review summarizes related social scientific research internationally, domestically, regionally, and locally within the Puget Sound region (see Appendix A). It includes an historical and legal overview of the Puget Sound Action Agenda, its strategic initiatives, and their importance. It defines and describes the role of municipalities, stormwater management, LID and SMPs in the implementation of the Action Agenda. It outlines the legal and regulatory framework within which Puget Sound municipalities function and the challenges faced by the complexity of their own structure. It identifies methods employed in similar social science research investigating barriers to green infrastructure implementation, and presents results of that research in a narrative and table format.

The literature review has established a base set of known barriers and solutions to green infrastructure implementation that can be organized under the categories of technical and physical, legal and regulatory, financial, and community and institutional. Widely recognized barriers include risk and uncertainty, maintenance burdens, design and construction hurdles, lack of design standards, unsuitable soils, aging infrastructure, conflicting codes and regulations, insufficient mandates, fragmented responsibilities, funding and cost, lack of understanding and knowledge, insufficient incentives, uncertain maintenance costs, inadequate valuation of nature and ecosystem services, public and municipal staff resistance to change, lack of inter-agency cooperation, and programmatic challenges (Abhold, Loken, & Grumbles, 2011; Allen, 2011; Dochow, 2013; Eger, 2011; Kane, 2012b; Keeley et al., 2013; Lombard, 2006; Roy et al., 2008; Stockwell, 2009; White House Council on Environmental Quality & EPA, 2012). The barriers identified in this review of the literature informed the inquiries that follow.

The funding and cost of green infrastructure and LID is a subject of considerable concern in the literature. Cost, as well as funding, often appears as a barrier to implementation (Abhold et al., 2011; Bowman & Thompson, 2009; Dochow, 2013; Olorunkeya, Fassman, & Wilkinson, 2012; Roy et al., 2008; Visitacion, Booth, Asce, & Steinemann, 2009). The perception of higher costs is qualified by studies suggesting lower costs for green infrastructure, especially when considered over the long term, weighed within the context of ecosystem services, or when externalized costs and incentives are taken into account (Abhold et al., 2011; Bowman & Thompson, 2009; Eger, 2011; Farber et al., 2006; Kane, 2012b; Olorunkeya et al., 2012; White House Council on Environmental Quality & EPA, 2012). In the Puget Sound Region, municipalities have faced decreasing budgets while experiencing a trend of population growth corresponding with increased pollution and pressure on ecosystem services (Wellman, Biedenweg, & Wolf, 2014b). Stormwater issues abound and annual management expenditures already average about \$100 per capita per year but the economic value of benefits from avoiding damages and stressors to ecosystem services in many counties and municipalities remain less explicit to local government planners and decision makers (Visitacion et al., 2009). On a national scale municipalities are using a diverse range of strategies to fund green infrastructure practices, including the leveraging of stormwater utilities, credit incentives for commercial and individual implementation of LID technology, federal funding programs, such as the Clean Water and Drinking Water State Revolving Loan Funds or 319 grants for control of nonpoint source pollution, and public-private partnerships, (White House Council on Environmental Quality & EPA, 2012). Issues related to cost and funding are both challenging and complex.

The Puget Sound basin boasts a natural wealth able to supply an assortment of ecosystem services. Economists have estimated that the ecosystem services and goods in the region account for benefits worth \$9.7 billion to \$83 billion annually. These services include water, flood protection, recreation, and more. If evaluated as a capital asset their worth would be between \$305 billion and \$2.6 trillion (Batker et al., 2008; Batker, Kocian, McFadden, & Schmidt, 2010). The loss of valued species can have negative consequences economically, socially, and culturally. Typical accounting schemes that do not include natural and cultural capital lead to a devaluation of these assets within decision-making processes (Batker, Barclay, Boumans, & Hathaway, 2005; Wellman, Biedenweg, & Wolf, 2014a). A management approach—the ecosystem services approach— integrates ecology and economics to help explain the effects of policies and impacts on functionality of ecosystems and human welfare (Farber et al., 2006). It follows that, in order to achieve an economically sustainable future, investment must be shifted away from those that damage ecosystem services towards those that recover and sustain them (Batker et al., 2008, 2010; Harrison-Cox, Batker, Christin, & Rapp, 2012; Lombard, 2006). A comprehensive approach to ecosystem management considers the value of ecosystem services, but these costs may not be apparent in municipal accounting systems.

With new municipal stormwater permits requiring the use of LID, demand for training is anticipated to exceed current provider capacity. A project team made up by The Washington Stormwater Center, Veda Environmental, Cascadia Consulting Group, and the Washington State University Social and Economic Sciences Research Center came together to conduct two statewide surveys (Washington Department of Ecology, 2013). These web-based surveys were designed to facilitate an understanding of the capacity of present LID service providers to meet increased need for training. The surveys assessed the interest level of potential contributors to fill instruction gaps as well as the type and level of training necessary for stormwater professionals. The survey results, gathered from November 2012 to January 2013, informed the project team as they completed a LID Training Plan for Washington State.

The statewide LID training study concluded that regional coordination will be essential to ensure an efficient use of limited state resources and that program support is essential, particularly support with funding, marketing, and curriculum development. Issues identified as key to advancing LID in Washington State included: developing regionally relevant case studies that present costs and methods of maintenance, costs of complying with new regulations, and other issues and developing guidance on communicating LID concepts with members of the public (Washington Department of Ecology, 2013). The Assessment revealed some concerns surrounding LID. These included cost, operations and maintenance, feasibility, design standards, and designer/engineer/builder knowledge. The survey respondents from the non-government sector reported using LID knowledge and practices on a much greater proportion of their projects than government respondents. The study's comparison among government types also showed that NPDES stormwater permit Phase I governments appear to use LID on a greater proportion of projects than Phase II governments. The survey results and analysis guided policy makers to implement more introductory, mid, and advanced level curriculum development and trainings to a wide breadth of professionals including: permitters/planners, inspection/enforcement professionals, designers/engineers, elected officials/managers and real estate professionals.

The surveyed literature derives from international, national, and regional studies. Much of the national data comes from east of the Rocky Mountains and the extent to which barriers identified in

these sources are reflective of the challenges faced by municipal employees in the Puget Sound region remains unclear. The results of the literature review are summarized in a table format organized by type of barrier and correlated with coding used in our subsequent analyses (see Appendix A). Most of the existing studies aggregated responses from municipal employees together with responses from community members, developers, non-governmental organizations, and/or federal and state agencies. Other studies failed to include municipal employees in their data set altogether, and instead focused on the public perception of barriers. As a result, patterns specific to municipal employees within the Puget Sound region, across jurisdictions, and across staff hierarchies had yet to be identified prior to this study.

## Research Methods

The mixed methods employed in this ethnographic research project enable both breadth and depth of analysis. A literature review revealed a list of known barriers and solutions to green infrastructure in global settings and gaps in knowledge locally and with municipal employees in particular. Participant observation helped LEAF School faculty and staff build a working knowledge of green infrastructure and an effective social network that included local municipal employees from throughout the study region. We complemented our selective observations in informal settings with a document analysis of formal representations of municipalities on websites and in reports to regulatory agencies. The breadth of the document analysis ensured that all target municipalities are represented in the data set, facilitated creation of a demographic baseline against which other methods could be evaluated, and guided the selection of case studies representative of each of the key demographic variables in the research questions. Interviews provided an in-depth analysis of nine case studies of selected municipalities that also ensured a broad internal coverage of municipal divisions and hierarchies. Cognitive concept maps elicited details of structure, function, and communication within each of our focal municipalities. The case studies helped identify the spectrum of barriers, solutions, characteristics, and interdepartmental communication for a quantitative examination in the online surveys. Interviews and online surveys provided municipal employees an opportunity to address the research questions anonymously and independently from formal representations to the public and regulators. Survey responses expanded the data set of municipal employees and facilitated statistical analysis of patterns across and within municipal governments of the Puget Sound basin.

The most common approaches to investigating barriers to green infrastructure in the literature have included mixed methods of literature reviews, interviews, and online surveys. Our research also employed these methods but complemented them with participant observation, focus groups, mapping exercises, and document analysis. Literature reviews have been a primary component of several key studies of barriers to green infrastructure (Carter, 2009; Dochow, 2013; Roy et al., 2008) and of Puget Sound recovery (Lombard, 2003). Bernard (1994, p. 118) insists, “It is impossible to overemphasize the importance of a thorough literature search” and we have taken that advice to heart with an extensive review of the literature. Similarly, interviewing is “a basic mode of inquiry” in qualitative research that enables people to share their stories and experience (Seidman, 2013). A semi-structured interview focuses on a single key consultant and is guided by questions, many of which are open-ended, allowing elaboration and clarification (Handwerker, 2001, pp. 121–123). Several researchers investigating green infrastructure challenges have used a two-stage process that began with locally focused semi-structured interviews; results from which they used to design surveys to reach a broader or more geographically widespread base (Abhold et al., 2011; Allen, 2011; Bowman & Thompson, 2009; Keeley et al., 2013; Olorunkiya et al., 2012). Researchers have also used semi-structured interviews of professionals to elicit cognitive maps (Wolf, Blahna, Brinkley, & Romolini, 2013). Participatory mapping has its roots in rapid rural appraisals and has been used “to develop: (1) conceptual maps of how events are interrelated with meanings and associations; (2) physical maps intended to retrieve local knowledge of those places... and (3) ‘counter mapping’ to document indigenous and other land claims to be recognized by the state” (Pinel, 2014, p. 174). Online surveys enable reaching a broader sample for a subset of the research questions more efficiently, while providing the opportunity for the use of scales to rank the relative importance of specific data. Likert scales, one of the most common forms of scaling (Bernard, 1994, p. 297), have provided valuable

results in previous studies of a similar nature (Allen, 2011; Bowman & Thompson, 2009; Bowman, 2011; Donatuto, Grossman, Konovsky, Grossman, & Campbell, 2014; Hard, Hoelting, Christie, & Pollnac, 2012; Ramos, 2014; Wehner, 2011), while addressing the need for more quantitative analyses in environmental anthropology (Charnley & Durham, 2010). These mixed methods allow for depth, breadth, and triangulation.

While this rapid ethnographic project is targeted in its application of specific mixed methods it also draws from and extends upon a decade of participant observation by the LEAF School faculty and staff in the Puget Sound region. We employed a phased and layered process that used a literature review, participant observation, interviews, public document analysis, and an online survey to examine perceptions and patterns of barriers to implementing the Action Agenda in municipalities throughout the twelve county region. The research benefited from an already established social network between lead investigators and Puget Sound municipalities, built through collaborative service-learning and community-based research projects in habitat restoration, shoreline management, LID, ethnobotany, fish and wildlife monitoring, ethnography, archaeology, and environmental education (Cowan, 2013; Den Adel et al., 2011; Graves, 2011; Muhlstein, 2014; Murphy & Coale, 2015; Murphy, Griesbach, & Ryan-Peñuela, 2014; Murphy, Richards, & Blaustein, 2011; Murphy, 2007, 2009; Stevick, 2007). Via triangulation, each of the varied methods achieves specific, complementary and overlapping project goals, and as a group increases the reliability of project findings.

### Ethnographic Assumptions and Theories

Participant observation is the hallmark of ethnographic research methods. Ethnography aims for “a *holistic* approach to the study of *cultural systems*” (Whitehead, 2005, p. 4), one that enables a “thick description” of cultural phenomena even when they are disparate and contested (Geertz, 1973). A participant observer is “directly involved in community life, observing and talking with people as you learn from them their view of reality” (Agar, 1980, p. 114). Participant observation involves “getting close to people and making them feel comfortable enough so that you can record information about their lives” (Bernard, 1994, p. 136). This approach enables access to different kinds of data, often unavailable through other methods. It “reduces the problem of reactivity—i.e. people changing their behavior when they know they are being studied,” helps the researcher “formulate sensible questions, in the native language,” and offers “an intuitive understanding of what’s going on in a culture” that is rich with meaning (Bernard, 1994, pp. 140–141). By holding the insider or emic perspective of a participant in tension with an outsider or etic perspective of an observer, this method helps to ensure “that one is close enough to see what is going on, but not so close as to miss the wood for the trees” (Bate, 1997, p. 1151). By immersing oneself in a community, a participant observer gains a deeper or “thicker” view of cultural phenomena.

Anthropology’s close relationships and deep ties to communities have fostered applied approaches to ethnographic practice that focus on research questions defined by and for communities of study. Identified by various terms such as collaborative anthropology (Fluehr-Lobban, 2008), engaged anthropology (Low & Merry, 2010), public anthropology (Lamphere, 2004), participatory action research (Baum, MacDougall, & Smith, 2006), and community-based participatory research (T. P. O’Toole, Kaytura, Chin, Horowitz, & Tyson, 2003) these approaches share some common tenets. A team of applied anthropologists gathered in Seattle, WA for the 2011 Society for Applied Anthropology meetings to discuss founding principles underlying these applied approaches (Hinshaw, 1979; Tax,

1977). The team synthesized and agreed upon some common tenets underlying Action Anthropology. These tenets guide the general work of the LEAF School as well as the approach of this specific project. These statements, like the first person narrative adopted in this report, recognize the active role of participant observers in the research process rather than the approach used in some social science literature of disguising researchers' roles through third-person narratives and passive voice.

1. We serve at a community's discretion and direction.
2. We recognize that we can never fully know a community and its needs; but to the extent we can, it takes time, and we therefore temper our bias for action by avoiding premature choices and responses.
3. We work collaboratively with a community to develop alternatives for improving conditions.
4. We respect the right and ability of a community to make choices affecting its future and the freedom to make its own mistakes.
5. We are open and truthful.
6. We promote community sustainability and capacity building, and we strive to work ourselves out of a job.
7. As professionals, we learn from our experiences and use them to improve our method and theory.
8. We recognize that our source of funding can present conflicts of interest, and we confront this problem by insisting on professional independence.
9. We share what we have learned with the community, our professional colleagues, and others, as appropriate, to improve the human condition. (Stapp, 2012, pp. 3–4)

Applied approaches in anthropology have been complemented by more engaged methods across the social sciences. As social scientists more generally have adapted an engaged approach, social marketing has emerged to address the challenge of human behavioral changes necessary for the development of a more sustainable future. Human behavior is at the root of problems as diverse as public health, water quality, biodiversity, energy and waste management, and transportation choices. Social marketing draws from the social sciences and marketing research to develop behavior change efforts that go beyond large-scale information campaigns. Recognizing that behavior change requires more than information, social marketers identify five critical steps underlying community-based approaches, the first two of which are relevant to this endeavor.

1. Selecting which behavior to target
2. Identifying the barriers and benefits to the selected behavior
3. Developing a strategy that reduces barriers to the behavior to be promoted, while simultaneously increasing the behavior's perceived benefits
4. Piloting the strategy
5. Evaluating broad scale implementation and ongoing evaluation once the strategy has been broadly implemented (McKenzie-Mohr, Lee, Schultz, & Kotler, 2012, p. 4)

The current project exemplifies an engaged anthropology that is active, collaborative, and responsive to community needs. The research project identified policy integration of the Puget Sound Action Agenda as a desired behavior change (Step 1 above) and employed multiple methods to identify



barriers to achieving that goal (Step 2). The results of the proposed research can be helpful in future steps of formulating, piloting, and evaluating strategy for reducing barriers that is attentive to both individual behaviors of municipal employees and the institutional structures within which they conduct their work. The changes required for greater green infrastructure policy integration across Puget Sound municipalities are complex. They stretch beyond the behaviors of individual municipal employees and may include modifications of institutional structures and processes.

### Quality Assurance Measures

Triangulating participant observation with document analysis, interviews, focus groups, and surveys helps to assure quality results. Participant observation might typically take a year or more but shorter rapid assessments have proven useful and generated valuable data. Shorter-term projects run the risk of critique as “jet-plane ethnography” or being “quasi-anthropological” (Bate, 1997, p. 1150). Yet, in practice, “a lot of participant observation studies are done in a matter of weeks” (Bernard, 1994, p. 139). Applied anthropologists often lack “the luxury of doing long-term participant observation fieldwork and may use rapid assessment procedures instead” (Bernard, 1994, p. 139). The research underlying this report took place within a short-time frame, from February to August, 2015, but built upon a long-term engagement of LEAF School faculty and staff in the Puget Sound region.

In a rapid assessment the focus is on answering targeted research questions, rather than the longer term process of developing rapport and understanding larger cultural contexts. This targeted approach can be most effective when it employs triangulated methods and follows longer-term, deeper engagement in communities, as it does here. Rapid assessment, also known as quick ethnography, consists of using a triangulated package of conventional data collection tools like key consultant interviews, surveys, mapping exercises, cultural data analysis, project management tools, and data analysis to facilitate more efficient fieldwork (Handwerker, 2001). Triangulation can involve “using multiple team members and/or research methods, such as key informant interviews and behavior observation, to gather similar data” that can then be compared to verify accuracy (Harris, Jerome, & Fawcett, 1997, p. 376). Confidence in results from rapid assessments “can be increased by using: multi-disciplinary teams, team members who are indigenous to the culture, multiple data collection methods, and when possible, random selection of participants and communities” (Harris et al., 1997, p. 377). In pursuit of some questions, though, “key informants” who are “keen observers of their own culture or organization” are more valuable than someone selected to be “statistically representative of a segment of the population” (Pinel, 2014, p. 173). Rapid ethnographic assessments that use a variety of triangulated methods can produce accurate and useful results in a more constrained time frame than the classical long-term participant observation fieldwork.

The triangulated methods utilized here include participant observation, interviews, focus groups, surveys, and document analysis. We used multiple researchers, each of whom has been a long-term participant observer in Puget Sound recovery efforts. In this particular project, we opted for strategic, comprehensive, and opportunistic rather than random selection of participants and communities. A comprehensive analysis of documents, such as NPDES Stormwater permit reports to the Department of Ecology, generated data on how municipalities represent themselves to the public and regulatory agencies. We used the data from these documents to help select our case study communities. The case studies that we chose included those that represented themselves as both successful *and* challenged by the implementation of LID and green infrastructure. Case studies were

also chosen based on demographic information including one or more of the key variables in our research questions: city/county, size, NPDES permit status, urban/rural, and geographic diversity. Within our smaller case studies, that were not stormwater NPDES permittees, we aimed for comprehensive interviews of all key staff who were willing and involved with green infrastructure across common divisions within municipalities: public works, community development, permitting, planning, maintenance, engineering, etc. In the larger communities we used strategic snowballing to ensure broad representation across the divisions. The document analysis and interviews informed the surveys that subsequently enabled us to increase sample size and breadth in order to facilitate statistical analysis and foster comparisons and contrasts with results from participant observation, interviews and document analysis. Participant observation deepened our engagement in a variety of communities while serving as a check on the other methods. For example, we learned from participant observation that municipal staff directed the surveys to people who they perceived as the local experts on green infrastructure even though we had sought and requested a broader audience. Throughout the research process we took careful measures to protect the confidentiality of the people we spoke with, interviewed, and surveyed as well as the specific municipalities they represented (see Appendix H). Collectively these mixed methods contribute valuable data while serving as a quality assurance measure qualifying the results collected by each respective methodology.

### **Participant Observation**

As participant observers, the researchers attended a variety of workshops, trainings, conferences, and events led by or for municipal staff engaged in the implementation of Shoreline Master Program, low impact development, and other aspects of the Puget Sound Action Agenda. Observations and informal conversations in these settings helped build rapport and provide access to spontaneous expressions that would have been less likely to occur in more formal interviews, focus groups, and surveys. The educational and public comment format of many of the events was particularly amenable to discussion of challenges and solutions to the implementation of Puget Sound Action Agenda. Participant observation took us into communities well beyond those of our case studies thereby helping to broaden our sample and assure a more comprehensive analysis.

A focal point for participant observation was the Statewide LID Training Program. The Washington State Department of Ecology and Herrera Environmental Consulting designed and facilitated a two-year series, entitled; “Washington Statewide Low Impact Development Training Program.” The trainings, designed as a solution to some of the barriers identified in the literature review, consist of a number of modules for the introductory, intermediate and advanced level practitioners (Washington Department of Ecology, 2013). The advanced trainings in which we focused our effort were designed to be highly interactive, thereby providing an excellent forum for participant observation. Conferences, trainings, meetings, and community consultations on green project proposals and shoreline management constituted another focal point for participant observation. Informal conversations during participant observation provided valuable information while helping to build relationships that fostered higher quality discussions during interviews and higher response rates on surveys. By participating in everyday activities of our communities across the region, we were able to observe municipal employees in comfortable settings where they could share informally their experiences with implementing the Action Agenda. Contacts established in these settings became candidates for semi-structured interviews, focus groups, and/or survey respondents. By focusing on

trainings, conferences, and events related to implementing LID and SMP researchers targeted participant observation to those settings most appropriate for discussion of topics related to the research questions and where potential interviewees and survey respondents were concentrated. By identifying ourselves as anthropologists examining barriers to green infrastructure policy integration we invited discussion with participants who were often eager to share their perspectives. As observers, the researchers listened for spontaneous discussion of challenges and, when appropriate, engaged participants in conversation about the spectrum of barriers associated with implementation of green infrastructure. We recorded highlights of these conversations anonymously in hand written field notes and then compiled and synthesized them (see Appendix B). Insights gained and relationships built during participant observation complemented and facilitated our interviews and surveys.

### Document Analysis

Documents such as news stories, websites, and technical reports included important information related to the implementation of green infrastructure called for in the Action Agenda. Materials produced for public consumption or regulatory compliance may reflect carefully chosen language and the content may be adapted for particular audiences, but these documents still contain valuable information relevant to our research questions. These documents proved helpful in strategically identifying potential case studies, interviewees, and survey participants. We reviewed and searched the website of every town, city, and county we could identify within the Puget Sound region for self-reported status of LID projects and policies and associated publications. We incorporated the publications from municipal websites in the literature review and used the presence, absence, and quality of statements about green infrastructure as criteria in selecting our case studies.

### Baseline Puget Sound Data

Drawing from a list of Puget Sound municipalities provided by Puget Sound Partnership we created a baseline of key demographic variables in our research question. The purpose of the baseline is to have a data set against which to compare and contrast the demographic variables from the NPDES Report documents, interviews, and survey respondents. The baseline analysis reveals that 21% of Puget Sound municipalities have a population of less than 2,500 (small), 47% have a population between 2,500 and 25,000 (medium), 22% have a population between 25,000 and 100,000 (large), and 10% have a population over 100,000.

90% of target municipalities are cities and towns, and 10% are counties. 34% are located within Washington Department of Ecology’s Southwest Region (Clallam, Jefferson, Kitsap, Mason, Thurston, or Pierce Counties), while 66% are located within the Northwest Region (Whatcom, San Juan, Island, Skagit, Snohomish, or King Counties). Non-permitted municipalities make up 34% of Puget

### BASELINE: JURISDICTION SIZE

- Very Large (>100,000)
- Large (25,000:100,000)
- Medium (2,500:25,000)
- Small (<2,500)

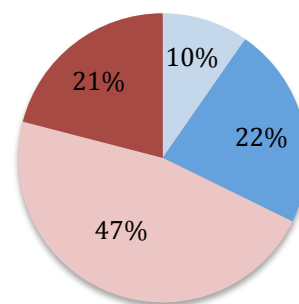
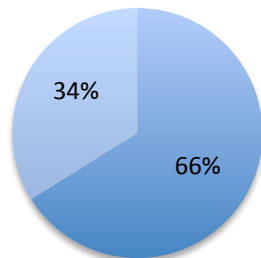


Figure 1.1 Baseline: Jurisdiction population size

Sound municipalities while 62% are Phase II NPDES permittees and 4% are Phase I permittees. In comparing and contrasting these baseline data with data from subsequent methods, it is important to note that the baseline ratios refer to types of municipalities while some of the data sets (interviews and survey respondents) are employees, not municipalities. Thus, we both expect and see that larger municipalities with more employees constitute a greater proportion of employee data sets than we would find in the baseline ratios based upon municipal type.

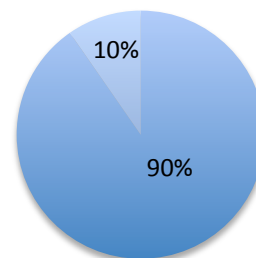
**BASELINE: JURISDICTIONS BY REGION**

■ Northwest (82) ■ Southwest (42)



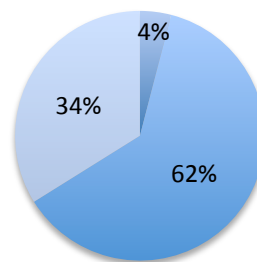
**BASELINE: CITY/COUNTY**

■ City (112) ■ County (12)



**BASELINE: NPDES STATUS**

■ Phase I (5) ■ Phase II (77) ■ Non-Permittee (42)



*Figure 1.2 Baseline: Jurisdiction region, city/county and NPDES Status*

**NPDES Permit Reports**

Reports on barriers to the implementation of LID by municipal NPDES permittees for the Washington Department of Ecology provided valuable data for document analysis. Ecology’s 2010 reporting guidelines requested that municipal permittees identify barriers and solutions to implementation of LID in their jurisdictions. We reviewed reports from 63 cities and 6 counties, all those which we could obtain.<sup>1</sup> Using our list of common barriers and solutions from the literature review and participant observation as well as ones we encountered in the reports themselves, we created codes in Atlas.ti (see Appendix E). We coded the first appearance of each barrier and solution in a report to calculate frequencies and distribution of codes across the reports and the followed up to gather qualitative quotes reflective of the codes.

<sup>1</sup> We were unable to obtain reports from 16 cities and one county in the region. Potential reasons for the missing reports could include a change in permit status between 2010 and present, inability of Department of Ecology staff to locate the required list of LID barriers within a much larger report, lack of report submission by municipality, incomplete or misplaced report, or inadvertent oversight.

With the exception of small, non-permitted jurisdictions, the reports are representative of our baseline demographics. None of the small jurisdictions (<2,500) submitted reports because they are not NPDES permittees and thus not required to complete them. 52% of the reports came from medium-sized jurisdictions (>2,500 and <25,000), 32% came from large jurisdictions (>25,000 and <100,000), and 16% came from very large jurisdictions.

### NPDES REPORTS: JURISDICTION SIZE

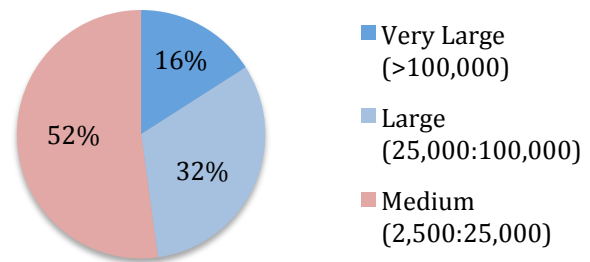
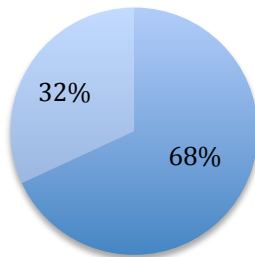


Figure 1.3 NPDES Reports: Jurisdiction population size

Phase II permittees produced 95% of the reports while Phase I permittees authored 6% of the reports. Overall, 91% of the reports came from cities and 9% from counties. Geographically 32% of the reports came from the Department of Ecology’s Southwest region (Clallam, Jefferson, Kitsap, Mason, Thurston, or Pierce Counties) while 68% came from the Northwest region (Whatcom, San Juan, Island, Skagit, Snohomish, or King Counties). Collectively, these reports provide a broad overview of municipal reports of barriers to LID prepared for a regulatory agency.

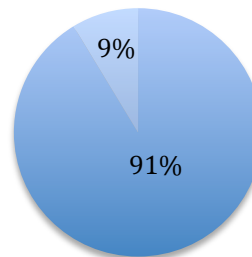
### NPDES REPORTS: REGION

■ Northwest (47) ■ Southwest (22)



### NPDES REPORTS: CITY/COUNTY

■ City (63) ■ County (6)



### NPDES REPORTS: PERMITTEE STATUS

■ Phase I (4) ■ Phase II (65)

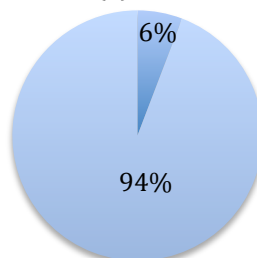


Figure 1.4 NPDES Reports: Jurisdiction region, city/county and NPDES permit status

The document analysis provided the greatest breadth of all of our methods. The website analysis included every municipality we could identify in the region and provided us with baseline

metrics to compare and contrast with the NPDES permit reports and representation of municipal characteristics from all of the other methods. The NPDES permit documents focused on Phase I and Phase II permittees and did not sample non-permittees, primarily small, rural communities. Patterns in barriers and solutions posed in these materials complement, overlap, extend, and vary from those found through other methods. The holistic approach of ethnography calls for including documents produced for the public and regulatory agencies in the analysis but with a recognition that the particular audiences for which the documents were prepared may impact the framing and representation of the information provided. Thus, the results of the document analysis need to be viewed critically and within the larger context of data collected through other methods.

### Interviews and Focus Groups

Interviewing, as a methodology, facilitated qualitative in-depth exploration of the research questions while helping to identify the breadth of variation to include in survey questions. The project staff used four types of interviews: informal individual, informal focus group, semi-structured individual, and semi-structured focus groups. Informal discussions most often took place or were arranged during participant observation as discussed above. An informal focus group early in the process targeted three selected, but confidential, Partnership employees who have had previous experience working within municipal governments. We neither recorded nor transcribed the informal focus group but we did take written notes. While the information gained in this initial informal focus group helped guide subsequent participant observation, semi-structured interviews, and the survey instrument, the notes from the informal interviews are not included in our data set for analysis. We took this measure to prevent confirmation bias (the Partnership is the agency contracting with us for the work). The intent of the focus group was exploratory. We pre-tested some interview questions, especially those involving social network mapping and sought former insider's perspectives on the formation of the research questions underlying this project.

Between April and June, 2015 we conducted a total of fifty-four (54) in-depth interviews. These interviews include informal, semi-structured one-on-one, and semi-structured focus groups. We consistently sought individual semi-structured interviews as our preferred form but the practicality of scheduling actual interviews within a short time-frame required accommodating the needs of our interviewees. When an interviewee requested an informal interview or asked if they could be interviewed as a team (thus creating a focus group), we honored their requests. Not doing so would have undermined our ability to get comprehensive coverage in smaller communities and supervisor approval in larger communities within a narrow window of time. Doing so meant that some of the responses may have been less forthcoming because of the presence of co-workers and, in a couple of cases, supervisors in the same room. Most interviews took place in the interviewee's office or a meeting room at the municipality. At the request of the interviewee several of the interviews included outdoor tours of green infrastructure. A few of the informal interviews took place in restaurants.

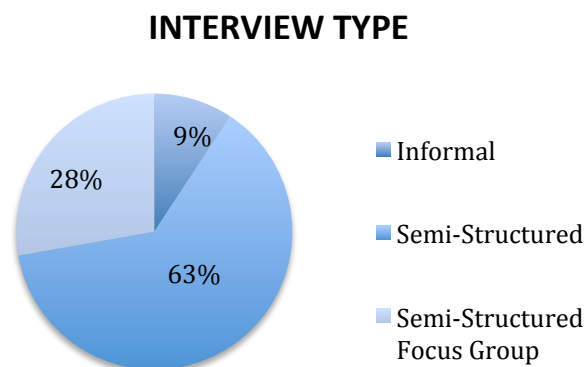
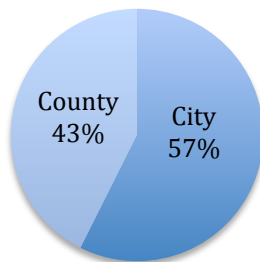


Figure 1.5 Interviews: Interview type

Interview lengths ranged from about 30 minutes to over two hours, but most were within a 60 to 90 minute range. Shorter interviews and those interviews that took place outside or in restaurants did not include the conceptual map exercise. We collected a total of 34 cognitive concept maps drawn by a total of 37 of our interviewees. During informal interviews the lead interviewer and research assistants recorded hand written notes. Researchers made digital audio recordings of semi-structured one-on-one, two-on-one, and focus groups. All but one, a telephone interview, took place face to face in or near the workplace of the interviewee. Verbal Ink, a third party contractor, transcribed the oral recordings. Research assistants then redacted all identifiers, reviewed the transcripts for confidentiality and accuracy, and coded for frequency and distribution of common barriers and solutions to green infrastructure policy integration (see Appendix E).

Goals of the interviews included confirming relevance of known barriers to specific municipalities as case-studies, identifying additional unknown barriers, creating a list of internal changes and external supports that might remove those barriers, and determining how and where relevant activities were housed within municipal organizations. Cognitive concept mapping addressed municipal social networks and helped evaluate relationships between municipal programs and identify where barriers are concentrated. The guiding questions and consent forms for the semi-structured interviews appear in Appendices C & D.

#### INTERVIEWS: CITY/COUNTY



#### INTERVIEWS: URBAN/RURAL JURISDICTION

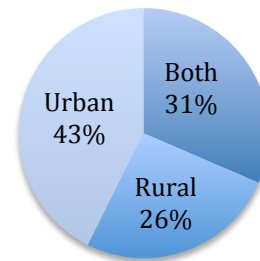
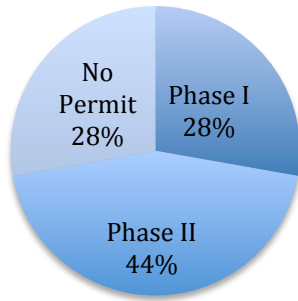


Figure 1.6 Interviewees by city/county and urban/rural jurisdictions

In order to ensure that we sampled broadly we sought interviewees spread across municipal types (cities and counties), population sizes, jurisdictional classification (urban and rural), and stormwater permit status. 57% of our interviewees came from cities and 43% from counties. 43% served only urban populations, 26% served only rural populations, while 31% served both. 56% of the interviewees came from large, 33% from medium-sized, and 11% from small municipalities. We were particularly attentive to the inclusion of representatives from medium, small, and rural municipalities whose perspectives can easily be overwhelmed by the larger number of employees in large urban jurisdictions. Medium and small municipalities have considerably fewer numbers of employees per municipality. In rural communities, one interviewee could represent an entire department, while in a larger community; there may be dozens of employees working within a similar department.



### INTERVIEWS: NPDES PERMIT STATUS



### INTERVIEWS: JURISDICTION POPULATION

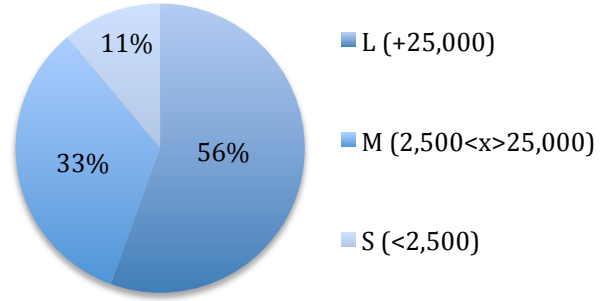


Figure 1.7 Interviewees by NPDES permit status and jurisdiction population size

We employed a snowball method to select interviewees. Initial interviews began with municipal employees with whom the researchers had already had long-standing relationships of trust. These were supplemented by individuals met during participant observation activities and identified via document analysis of municipal websites. We made cold contact via telephone with selected potential interviewees whose municipalities stood out in our document evaluation of websites and reports of barriers submitted to the Department of Ecology. We asked the initial interviewees for recommendations of subsequent interviewees (i.e., snowball). Rather than seek a random sample of municipal employees we sought knowledgeable consultants who we could expect to share thoughtful and reliable answers to the interview questions with special attention to ensuring that the interviewees reflected diversity within the following categories: cities and counties; large, mid-sized, and small jurisdictions; urban and rural jurisdictions; stormwater permittees and non-permittees; executive staff, middle managers, and line staff; and planning, permitting, public works, stormwater, and natural resource programs. These categories constitute loci where we might expect to see variation in responses to our research questions. Thus, an important purpose of the interviews was to establish the range of likely responses to our research questions in order to ensure that the key barriers, solutions, and other pertinent data were included in subsequent surveys.

In order to ensure depth and breadth we focused our selection of interviewees from nine (9) municipalities selected for their representation of the key variables in our research questions: cities vs counties, population sizes, urban vs rural, and NPDES permit status. These confidential case studies gave researchers an in-depth understanding of the barriers and relationships within individual municipalities. Counties made up two of the case studies and cities constituted seven. Three of our case studies identified their jurisdictions as both rural and urban, four as rural, and two as solely urban. Of the nine case studies, one is a NPDES Phase I, four are NPDES Phase II, and four are unpermitted, rural municipalities. The larger jurisdictions required more interviews than smaller ones because of the dispersion of responsibilities across a greater number of employees and departments. Because non-permittees were not represented in a significant portion of our document analysis we ensured that they were represented in the case studies, but again, a single employee had responsibilities that may be spread across many individuals and departments in larger municipalities. Collectively, these case studies provided important breadth across each of the key variables in our research questions.



CASE STUDY	URBAN/ RURAL	CITY/ COUNTY	NPDES	SIZE	RECORDED INTERVIEWS	INFORMAL INTERVIEWS	CONCEPT MAPS
#1	BOTH	COUNTY	NPDES I	L	13	2	8
#2	RURAL	COUNTY	NON	M	7	1	5
#3	BOTH	CITY	NPDES II	M	5	--	4
#4	URBAN	CITY	NPDES II	M	4	--	4
#5	RURAL	CITY	NON	S	2	--	2
#6	URBAN	CITY	NPDES II	M	6	1	4
#7	BOTH	CITY	NPDES II	L	8	--	4
#8	RURAL	CITY	NON	S	3	--	2
#9	RURAL	CITY	NON	S	1	--	1
OTHER	URBAN	CITY	NPDES II	M	--	1	--

Table 1.1 Interviews: Case studies by municipal type

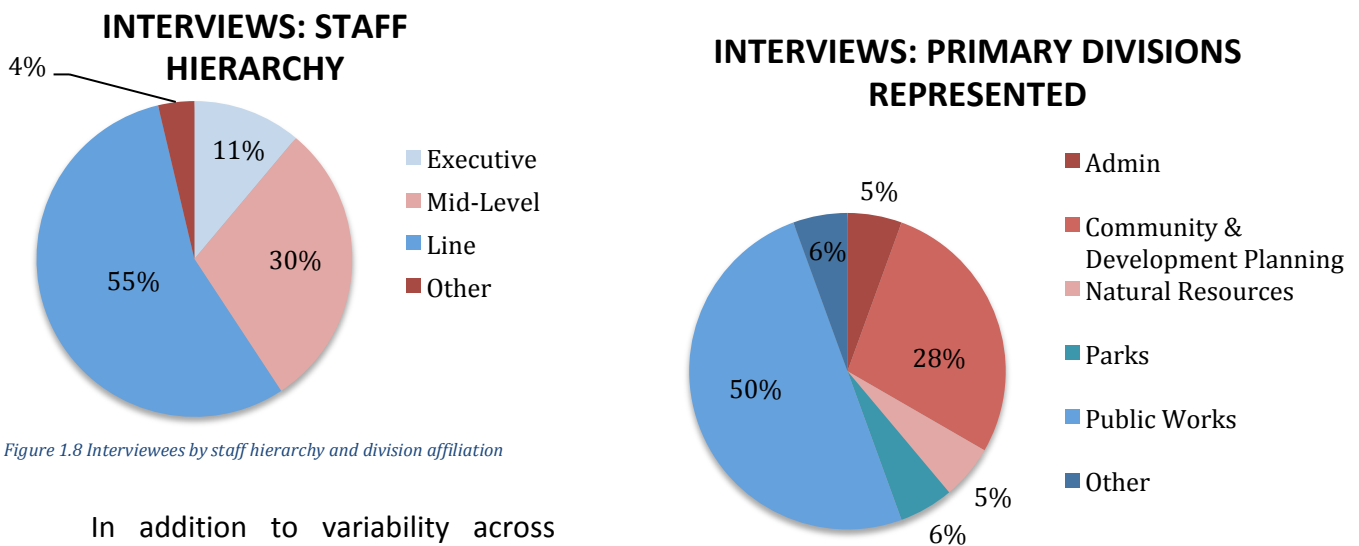


Figure 1.8 Interviewees by staff hierarchy and division affiliation

In addition to variability across jurisdiction types and size we sought diversity within municipal staff roles. We selected our interviewees from across multiple divisions within each organization and from throughout municipal hierarchies: line staff, mid-management, and executive staff to the degree possible within each case study. When asked to identify their primary division 50% of the interviewees described themselves as located within public works, a division that often included a surface water management functions and/or department. 28% of our interviewees described their division as community planning and/or development, while 6% worked in parks, 5% in natural resources, and 5% in an administrative division. Interviewees worked in a variety of subdivisions or departments and some worked in multiple divisions. 55% identified themselves as line staff, 30% as mid-level, and 11% as executive staff. 4% that we have identified as other were those who identified as both line and mid-level and/or they had recently worked for the municipality but now are working as a contractor or in an advisory position. Many of our interviewees from smaller municipalities played multiple roles in the hierarchy and across departmental functions. A

word cloud created via Wordle.net represents titles and roles of the 54 interviewees within their respective municipality, thereby illustrating both the diversity and commonality of their responsibilities and within the municipalities (Figure 1.9).

Figure 1.9 Interviews: Word Cloud of Interviewee Position Titles



### Cognitive Concept Maps

*“This is a good exercise because it's making me look at this conceptually a little differently.”*

As part of the in-depth semi-structured interview process, we requested a cognitive concept map from each interviewee who had sufficient time for a 60-90 minute interview. The cognitive concept map is a strategic interview tool that externalizes relationships and information flows. They are two-dimensional drawings that provide an external representation of structural knowledge (Jonassen & Marra, 1994). The maps allow the researcher to see participants' cognitive understanding, as well as, the connections that participants discuss across concepts or bodies of knowledge (Daley & Milwaukee, 2004). Cognitive mapping in interviews can graphically represent interviewees' perception and understanding of concepts and relationships between concepts or subjects. It can then be used as a tool to probe and better understand spatial, temporal and social relationships. The following list demonstrates attributes of the cognitive concept mapping tool that applied to the research at hand:

- Elicits perceptions of relationships: temporal, spatial, social (Christen, Kjeldsen, Dalgaard, & Martin-Ortega, 2015; Daley & Milwaukee, 2004; Eppler, 2006; Rye, Rubba, & Virginia, 1998; Tolman, 1948)
- Requires the interviewee to 'think on paper' (Zweifel & Wezemaal, 2012)
- Emphasizes depth in specific subjects (Daley & Milwaukee, 2004)
- Mediates the inner mental world and outer physical world (Zweifel & Wezemaal, 2012)
- Visually represents cognition of interviewee (Daley & Milwaukee, 2004)
- Can serve as a clarification tool (Rye et al., 1998)

- Identifies causal relationships between variables and/or concepts (Samsonovich & Ascoli, 2007)
- Triggers recollection and recognition (Rye et al., 1998)
- Increases recall of knowledge held in long-term memory (Rye et al., 1998)
- Provides for less linear representation of experience (Zweifel & Wezemael, 2012)
- Elucidates complex settings that include a number of “different actors, complex relationships and messy processes” (Zweifel & Wezemael, 2012)

The cognitive concept map is a useful tool in interviews when interviewees exist, or perceives themselves as existing, within a network or series of relationships and it is the relationship, network, and/or organization dynamic that is of interest to the interviewer.

Of the total 54 interviewees, 37 of these interviewees participated in the cognitive mapping exercise. This resulted in the drawing of a total of 34 cognitive concept maps, each taking between 20-40 minutes to complete.<sup>2</sup> The mapping exercise required interviewees to draw out their understanding of the divisions, processes and relationships within the municipality as they relate to green infrastructure and the shoreline master program. Interviewees used markers or crayons and blank white butcher paper provided by the researchers.

Appendix C shows the specific guiding questions used to create cognitive concept maps. The interview questions correspond with research questions #5-8 that inquire about location and effectiveness of various functions related to green infrastructure and their location within the structure of municipal organizations. Researchers followed guiding questions with additional inquiries when needed and asked interviewees to describe their reasoning while mapping or after they were finished. Interviewees chose their own means for mapping and organizing their perceptions. The mapping exercise helped elicit qualitative responses exploring concepts and experience in depth.

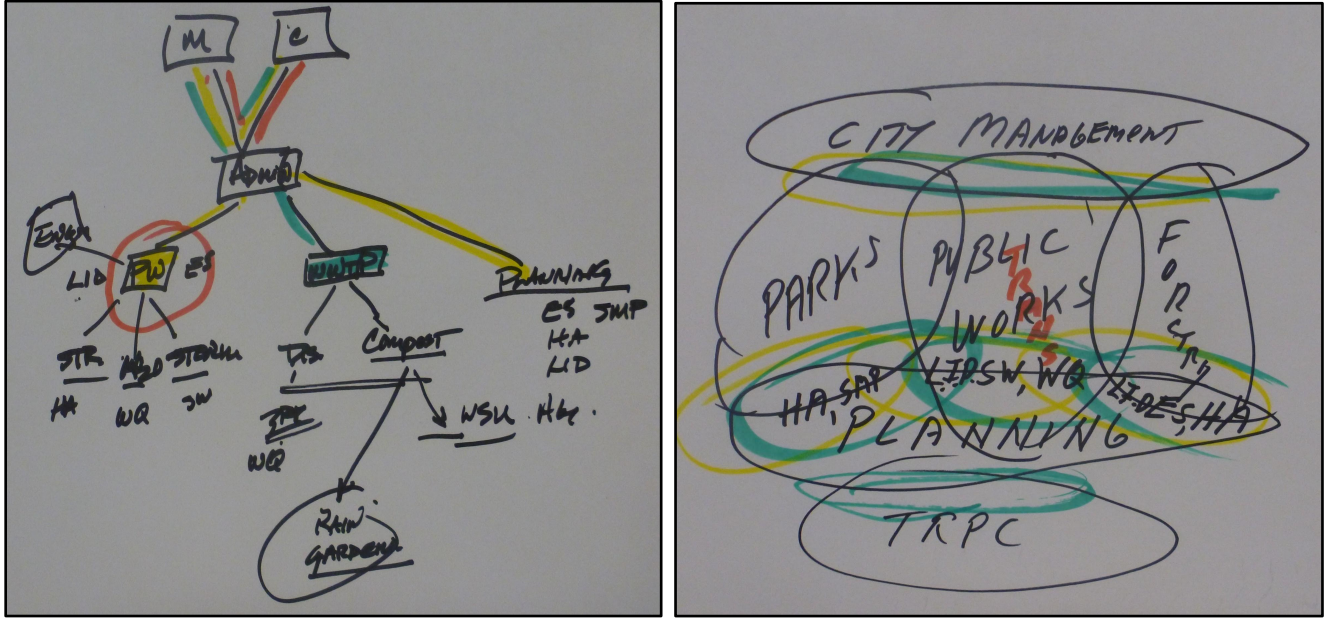


Figure 1.10: Examples of cognitive concept maps from interviews

<sup>2</sup> Some of the collective interviewees preferred to collaborate on a map, rather than each draw their own.

## Surveys

The literature review, participant observation, document analysis, and interviews not only provided valuable data collection methods on their own terms, they served as information gathering tools from which we constructed an online survey. Working from a set of identified barriers to green infrastructure, as well as potential forms of external support and internal changes that might help remove those barriers, we were able to create survey questions that would enable identification of patterns across the region. Close-ended questions asked respondents to rate, via Likert scales, the relevance of known barriers in their experience, and the value of proposed internal changes, and external supports. Additional questions asked respondents to identify functions related to green infrastructure in their own departments and rate the effectiveness of communication with other divisions in the municipality. We invited respondents to include and rate additional barriers, internal changes, and external supports in open-ended questions (see Appendix F).

The anonymous surveys collected demographic data enabling comparisons across and within jurisdictions. For example, we asked respondents to check the following variables that apply to their position and location of employment: urban, rural, county, city, town, large, medium, small, stormwater permittee or not, executive staff, middle managers, line staff, planning, permitting, public works, stormwater, and natural resources. The purpose of the survey was to facilitate quantitative analyses of data as a tool for identifying the extent to which the perceptions of barriers and solutions apply across and within different types of municipalities in the Puget Sound region.

We collected survey data using the Survey Monkey web-based infrastructure over a 21-day period, from June 2-23, 2015. We solicited and received the assistance of staff from Washington Department of Ecology, Municipal Research and Services Center (MRSC), Green Infrastructure Partnership (GrIP), Association of Washington Cities, Small Communities Initiative, Washington Stormwater Center, Stormwater Outreach for Regional Municipalities (STORM), and many anonymous municipal staff in distribution of the survey. Once the survey response collection window closed, we downloaded the data and stored them in Microsoft Excel for initial data quality inspection before importation into SPSS. At the close of the survey we had 244 responses. 28 respondents did not meet the demographic targets of this survey. Consequently, their responses were not included in the analysis. Some were not municipal employees, others came from outside the Puget Sound region. Once we observed a high level of quality, we imported the data from 216 respondents into IBM SPSS version 21 (SPSS) for statistical analyses, which we describe in detail below.

## Quantitative Summary

The survey data are comprised of a single, purposive sample from a Puget Sound area population in three forms: Demographic, Likert-type scalar, and non-mutually exclusive choices. A demographic study variable describes attributes about a respondent that is used to create a filtered dataset during statistical analyses. For instance, the first item of the survey asks, "Which of the following best describes the municipality where you work?" Respondents have three options: 1) City, 2) County, or 3) Other. All demographic variables have been held mutually exclusive for the purposes of this survey. If a respondent works for more than one municipality type (in the case of a contract, non-employee respondent), she might respond by choosing either the one she feels is most representative of her work or the 'Other' option.

Demographic survey items with mutually exclusive item attributes serve as independent variables for the purposes of most statistical analyses. The demographic choices of this survey are not only summarized below as percentage frequency distributions, they assume the role of independent variable when used for Analysis of Variance (ANOVA) assessments, which test hypotheses to help determine the influence of a particular demographic variable such as, “Which of the following best describes the municipality where you work,” upon a particular dependent variable with a Likert-type value response such as, “Soil suitability for infiltration,” when chosen as a response to the question, “Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction” (Q7). The dependent variables in this study present a Likert-type scale to respondents and may be considered interval, or scalar, data.

Likert-type scalar variables offer survey respondents a way to more subtly record their level of response by offering a range of choices. If we revisit the “Soil suitability for infiltration” example from above, the Likert-type choices available to respondents are “Not a barrier,” “Infrequent barrier,” “Common barrier,” “Persistent barrier,” and “Unknown.” Integer values unseen by respondents are defined for each of the choices. In the case of this variable, the hidden choices are 1, 2, 3, 4, and 0. These number values are used during the analysis phase and are crucial parts of descriptive statistical methods and summaries. It should also be noted that each of the Likert-type interval choices are mutually exclusive and represented by radio buttons on the survey form, unlike the non-mutually exclusive items represented by checkboxes there.

The non-mutually exclusive items represented by checkboxes on the survey offer respondents a way to “choose all that apply.” An example of this is survey item Q6, “Which of the following examples of green infrastructure policy and/or projects has your community successfully implemented? Check all that apply.” This item offers 25 choices, all of which could, theoretically, be checked by the respondent. Of course, it is highly unlikely that such an event would occur, but it is certainly not outside the realm of possibility. In the end, whether a respondent chooses one, several, or all of the checkboxes in no way affects the reliability of the data. The checkbox, non-mutually exclusive response items offer a way to collect inclusive data that are more descriptive than mutually exclusive choices and will be examined using factor, or principal component, analysis below.

## Statistical Summary

The statistical analyses conducted on the survey data are descriptive in nature. While it would be interesting to engage in inferential or predictive analyses with such a dataset, the primary goal of this study report as a policy assessment tool dictates the use of descriptive statistical methods and techniques. The data were imported into SPSS from a Microsoft Excel workbook, which was downloaded from the Survey Monkey website. Since no personal respondent data were collected and references to IP address or other geolocation data were removed from the dataset, data encryption was not used during the storage or analysis of the data.

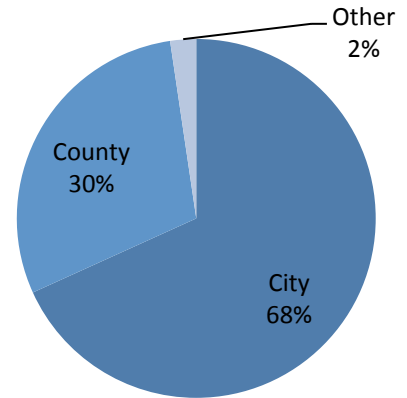
The first step in producing descriptive statistics for a given dataset typically involves summarizing the data in meaningful ways. For the purposes of this study, we summarize demographic variables below using tables and pie charts. Each table reflects the raw data from the survey analysis results and the pie chart graphically presents the composition of the sample choices for each item as percentages of the dataset, both with and without missing data. Please note that the total sample is comprised of 216 respondents with missing data dispersed throughout the dataset as respondents

chose to not answer certain items. Please also note that items 7 and 8 on the Survey Monkey website were collapsed into Q7 for the purposes of data analysis.<sup>3</sup> This removes Q8 from the analysis so that the items jump from Q7 to Q9 to maintain consistency with the Survey Monkey item presentation scheme.

The first demographic variable describes the municipality type in which respondents work.

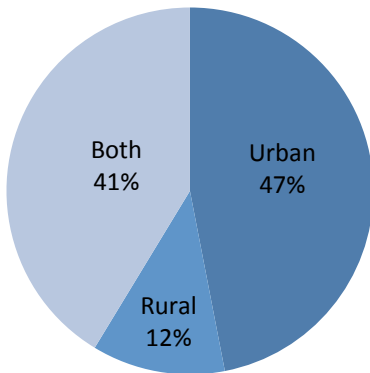
Figure 1.11: Survey: Respondents by city/county (Q1.01)

		Frequency	%	Valid %	Cumulative %
Valid	Other	5	2.3	2.3	2.3
	City	146	67.6	68.2	70.6
	County	63	29.2	29.4	100.0
	Total	214	99.1	100.0	
Missing	System	2	.9		
Total		216	100.0		



The second demographic variable describes respondents' municipal jurisdiction.

Figure 1.12 Survey: Respondents by urban/rural/both Q2

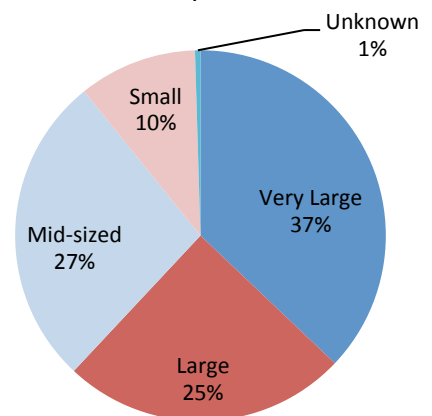


		Frequency	%	Valid %	Cumulative %
Valid	Urban	100	46.3	46.9	46.9
	Rural	25	11.6	11.7	58.7
	Both	88	40.7	41.3	100.0
	Total	213	98.6	100.0	
Missing	System	3	1.4		
Total		216	100.0		

The third demographic variable describes the population size of respondents' municipalities.

Figure 1.13: Survey: Respondents by jurisdiction population size Q3

		Frequency	%	Valid %	Cumulative %
Valid	Very Large	79	36.6	37.1	37.1
	Large	53	24.5	24.9	62.0
	Mid-sized	58	26.9	27.2	89.2
	Small	22	10.2	10.3	99.5
	Unknown	1	.5	.5	100.0
Total		213	98.6	100.0	
Missing	System	3	1.4		



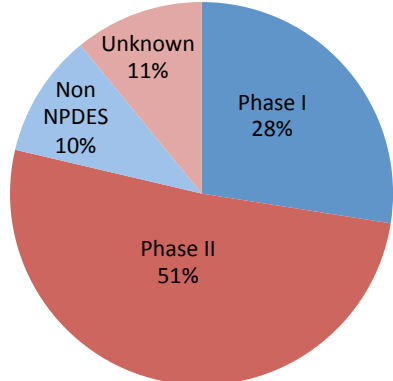
<sup>3</sup> After the initial pilot of our survey, we separated question #7 into two questions in response to feedback from initial respondents. The intent was to help the survey question fit better onto a respondent's computer screen.



Total	216	100.0
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The fourth demographic variable describes respondents' current relationship to the NPDES stormwater program.

Figure 1.14: Survey: Respondents by NPDES stormwater permit status Q4

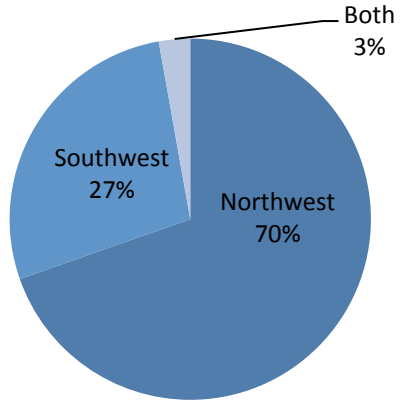


	Freq	%	Valid %	Cumulative %
Valid Phase I	58	26.9	27.5	27.5
Valid Phase II	108	50.0	51.2	78.7
Valid Non-NPDES	22	10.2	10.4	89.1
Valid Unknown	23	10.6	10.9	100.0
Total	211	97.7	100.0	
Missing System	5	2.3		
Total	216	100.0		

The fifth demographic variable describes the region within Western Washington of the respondents' municipality. Northwest includes municipalities within Whatcom, San Juan, Island, Skagit, Snohomish, or King Counties. Southwest includes municipalities within Clallam, Jefferson, Kitsap, Mason, Thurston, or Pierce Counties.

Figure 1.15: Survey: Respondents by Department of Ecology region, NW/SW Q5

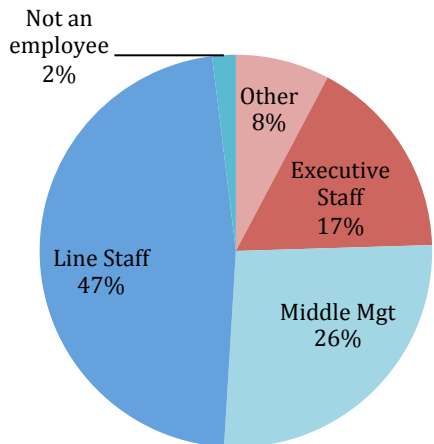
	Frequency	%	Valid %	Cumulative %
Valid NW	149	69.0	69.6	69.6
Valid SW	59	27.3	27.6	97.2
Valid Both	6	2.8	2.8	100.0
Total	214	99.1	100.0	
Missing System	2	.9		
Total	216	100.0		



The sixth demographic variable describes respondents' roles within their respective municipalities. Please note that those listed as "not an employee" self-identified as contracted staff for municipal governments. Other non-municipal employees who responded were excluded from the analysis.

Figure 1.16: Survey: Respondents by staff hierarchy Q11

	Freq	%	Valid %	Cumulative %
Valid Other	12	5.6	7.7	7.7
Valid Executive Staff	26	12.0	16.8	24.5
Valid Middle Mgt	41	19.0	26.5	51.0
Valid Line Staff	73	33.8	47.1	98.1



	Not an employee	3	1.4	1.9	100.0
	Total	155	71.8	100.0	
Missing	System	61	28.2		
Total		216	100.0		

Figure 1.16: Survey: Respondents by staff hierarchy Q11

The summary of demographic variables demonstrates our success in obtaining a robust group of respondents from each of our key variables. These numbers facilitate an Analysis of Variance (ANOVA). ANOVA is a way to check for the influence an independent variable might have upon the outcome value(s) of a dependent variable. The data type requirements for using this method are 1) The independent variable must be nominal with three or more categories and 2) The dependent variables must be interval or ratio data types. The independent/demographic study variables described above are nominal and the dependent/Likert-type scale variables are interval data types, so we satisfy both type criteria. All item response values were normally distributed, which is a necessary assumption for proceeding with the application of Cronbach’s alpha (Rea & Parker, 1997). The study data across items Q7, Q8, Q9, Q10 and Q14 all display a normal distribution with minimal skewing.

Before applying ANOVA to a dataset, the dependent, scalar variable items should always be checked for internal consistency. This check ensures the items are “measuring the same thing” between them or across all of their individual attributes. The most widely accepted measure of internal consistency and reliability across related Likert-type survey items or across multiple single item attributes is the use of the Cronbach’s Alpha statistical method. This method produces an index value used by social scientific data analysts to determine the internal consistency of the items under consideration (Faherty, 2008). When the resulting index value is 0.70 or greater, the analyst may accept the survey items measured as valid and reliable. Because this survey contains several discreet Likert-type items with multiple attributes, it would be imprudent to test all variables and their attributes across the entire survey. The results of such an effort would surely demonstrate how the entire survey is not measuring the same thing; indeed, it is not intended to do so. In order for Cronbach’s Alpha to hold relevance in the context of this survey study, we must produce it discreetly for items Q7, Q8, Q9, Q10, and Q14, all of which are Likert-type scale data types. All five items exceed the reliability index of 0.70 and four of them are above 0.90 (see Appendix I). These tests demonstrate that each item is internally consistent and reliable for the purposes of this study, including the application of ANOVA for identification of significant relationships between dependent and independent variables (see Results section below).

We begin all ANOVA analyses with a question. For our first analysis, we ask. “Is there a statistically significant relationship between ‘Which of the following best describes the municipality where you work?’ (Q1) and any of the item attributes of ‘Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction’ (Q7)?” Another way to state this is to construct null and alternative hypotheses specific to each variable-to-variable examination. For instance, we could present the following hypotheses for the Q1.01:Q7.07 ANOVA and assess the significance of the relationship as it is described in Table 1.2 below:



H<sub>0</sub>: A significant statistical relationship does not exist between the municipality where one works and the perception of risk/liability as a barrier to green infrastructure implementation.

H<sub>A</sub>: A significant statistical relationship exists between the municipality where one works and the perception of risk/liability as a barrier to green infrastructure implementation.

*Table 1.2 One-Way ANOVA Example: Statistical relationship between city/counties and barriers*

Item	df	F	Sig.
Q7.11 Insufficient enforcement of existing codes & regulations	1	10.326	.002
Q7.18 Developers not held accountable for environmental damage	1	10.933	.001

We reject H<sub>0</sub> and accept H<sub>A</sub>.

One-Way ANOVA analysis is used here in a way that presents the question, “Does Q1.01 as an independent (nominal) variable have any influence on the outcome of the dependent (scalar) Q7.11 and Q7.18 variables?” In this case, any significance (Sig.) measure less than .05 demonstrates a significant relationship between the two variables. Based on the results described in Table 1.2 above, the conclusion may be drawn that Q1.01 does, indeed, influence the outcome values of the items Q7.11 and Q7.18. Please note that only relations in which the significance value is less than .05 are displayed in the tables in Appendix J; therefore the null hypothesis is rejected for each relation. When a significance value is less than .05, it means there is a greater than 95% chance a significant relationship (influence) exists between the independent and dependent variables.

The survey serves to complement, extend, and place within a larger context the results of the literature review, participant observation, document analysis, and interviews. The value of the survey data comes from its amenability to statistical analysis, enabling more effective quantification and evaluation of responses. Collectively, our mixed methods serve as a check on each other, enabling identification of results that are consistent across methodologies as well as those that vary.

## Results

Mixed methods can produce complex results. Our approach here is to focus the results around answers to the research questions rather than a qualitative and quantitative summary of the results by methodology. This approach should be more informative to most of our audience but specialists may be more interested in some of the details. We provide the details in appendices. Appendix A and B, for example, contain tables of barriers and solutions from the literature review and from participant observation. We synthesized these data, along with those from the document analysis, interviews and literature review, to create the survey questions (see Appendix F). A one-way Analysis of Variance (ANOVA) identifies the significance of relationships between variables in the survey data (see Appendix J). Each heading below corresponds with one or more of our research question and is followed by a summary of responses to that question from our various methods as relevant to that particular topic.

### Barriers to Green Infrastructure

For the purpose of summarizing results the first four research questions can be lumped together under the general category of barriers to green infrastructure.

1. What are the perceptions held by municipal employees of barriers to implementation of Low Impact Development (LID) standards?
2. What are the perceptions of barriers to implementation of LID in municipal operations (e.g., right-of-way (ROW) management)?
3. What are the perceptions of barriers to municipal Shoreline Master Program (SMP) implementation?
4. What are the perceptions of barriers to comprehensive approaches to green infrastructure?

Following the work of Clean Water America Alliance (Abhold et al., 2011) we organized and analyzed our results from the document analysis and interviews under four primary categories: technical and physical, legal and regulatory, financial, and community and institutional. We first examined reports of presence and absence of barriers under these general categories and then examine each category in more depth. Following that analysis we examine responses from the general survey audience to identify ranked frequencies for identified barriers.

In the NPDES permit reports, the presence and absence of regulatory, physical/technical and community/institutional barriers appeared more frequently than the presence and/or absence of financial barriers. Figure 2.1 demonstrates the reported

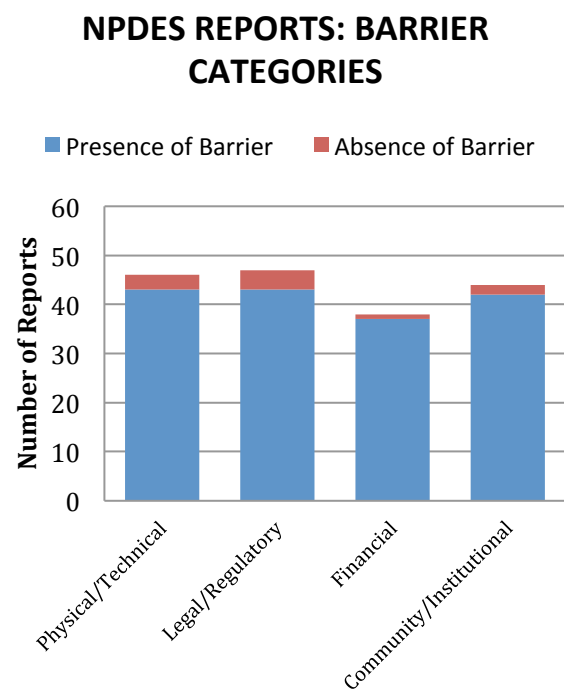


Figure 2.1 NPDES Reports: Barrier Categories

absence (in red) or presence (in blue) of a

barrier category. In 2010 reports to the Department of Ecology, municipal government representatives chose to emphasize the regulatory and physical/technical challenges more so than a broader sample of municipal employees would in their interviews with us in 2015.

### INTERVIEWS: BARRIER CATEGORIES

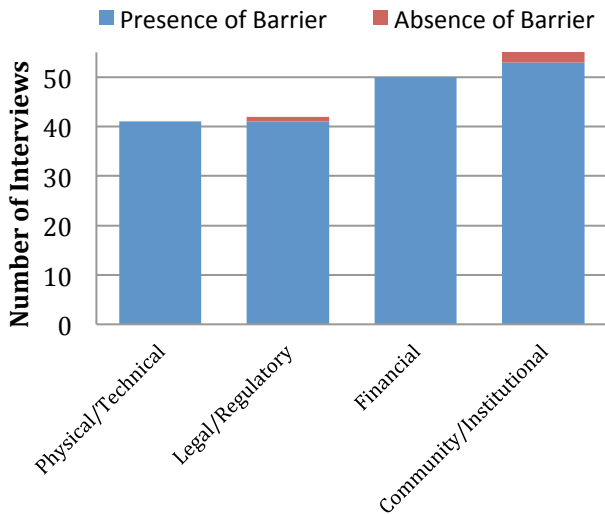


Figure 2.2 Interviews: Barrier Categories

Our interviewees emphasized the financial and community/institutional barriers more so than the regulatory and physical/technical. This could be a result of the time difference. The reports came from the 2010 reporting period, while the interviews took place in 2015. It is possible that municipalities have been focusing on addressing the regulatory and physical/technical barriers so that now, five years later, the financial and community/institutional barriers appear more significant in relative terms. It could also be a difference of perception between employees who prepared the reports and the broader spectrum of perspectives captured in our interviews. It might also be a difference between what employees choose to

emphasize under a condition of anonymity versus a formal report to a regulatory agency. Or, finally, it may be that the message of interviewees hoped to send to the Puget Sound Partnership, via our report, was one that emphasized the importance of financial challenges.

#### Physical/Technical Barriers

*“Things like, you know, rain gardens and other kinds of storm water management techniques aren't really viable here and the reason being is that we are so close to sea level and – I mean 70 percent of the town is in the 100-year flood plain adjacent to a marine aquatic, tightly influenced environment.”*

The most persistently reported physical barrier in the NPDES reports was soil suitability. 35 reports described class C till soils with poor infiltration rates. High groundwater table similarly appeared as a persistent barrier. This was also reported in the literature review. A common barrier was living in an area that was already built out, and having insufficient space to build green infrastructure. Other commonly reported barriers were steep slopes and a high physical maintenance requirement of LID facilities. Reports emphasize that, unlike traditional infrastructure, you cannot just go out once a year to pump a facility. More frequent maintenance is required. Setback requirements are also a common barrier to the implementation of LID facilities. Occasionally reported physical barriers include the lack of uniformity from one site to the next. Each site, it is occasionally noted, requires an assessment before LID design can occur, and engineers need to get involved earlier in the construction

process. Another occasional barrier is the distributed and small nature of the facilities, making it more difficult to perform ongoing monitoring and maintenance.

### NPDES REPORTS: PHYSICAL & TECHNICAL BARRIERS

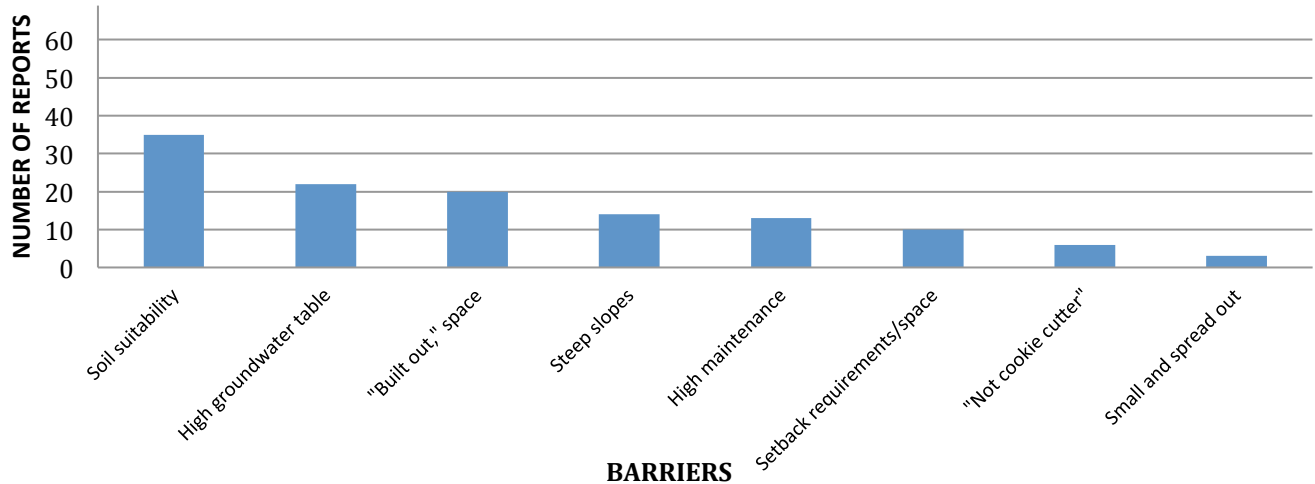


Figure 2.3 NPDES Reports: Physical & Technical Barriers

The most persistent physical barriers to green infrastructure mentioned in the interviews were soil suitability and the high maintenance requirement of LID facilities. One interviewee stated, “The change in maintenance practices that will be necessary to clean permeable pavement, it’s gonna take a lot more work than is typically needed for standard asphalt.” Soil suitability was another persistent barrier. An interviewee stated, “And then sometimes with – with some techniques, we're limited to the soils that are actually in the area, so we – I would say more than 50 percent, maybe 75 percent of the time, we can't do infiltration because of the soils. We can't get it to – 'cause they're tilled soils and thin layer.” Lack of space for LID techniques in already developed areas was another common barrier. An urban interviewee noted, “It’s challenging in an urban setting because we have smaller lots because we are trying to achieve higher density, so it makes it difficult to accommodate stormwater infiltration onsite compared to a rural setting where the lots are larger, you’ve got a lot more room to infiltrate.” Steep slopes appeared as an infrequent barrier. High groundwater occasionally came up as a barrier in the transcripts. This quote illustrates the challenge, “Our ground water level is about 18 inches... So, you know, storm water storage and retention and infiltration sort of approaches don't – aren't effective here. So we've had to really, you know, rethink our approach to it.” Soil suitability, maintenance, lack of space, steep slopes, site specificity, and high groundwater table are key barriers identified in the interviews.

Physical and technical challenges specific to the Shoreline Master Program received some attention, “basically the Shoreline Master Program says that for residential development you have to demonstrate -- you have to use low impact development techniques unless you can demonstrate that the site isn't suitable. And clearly, many sites aren't suitable on steep slopes for example.” An interviewee from a city with lots of rural roads illustrates the challenge posed by roads.

*Well I know specifically about the SMP and operation and maintenance because there was a lot of yelling about when the SMP was being updated that the biggest impact, according to some*

people, water quality or shoreline function, or conditions is run off from roads. And city maintained roads, and we have a lot of those little gravel roads, a lot of culverts, all of that isn't addressed -- it doesn't exist in the SMP. So, okay, that's hugely broken right there, so how do we fix that? Well we... monitor our Shoreline Master Program for the next six years and then we get to our next update and we have the argument again.

Technical and physical challenges of soil suitability, steep slopes, and roads appear in discussions of SMP.

### INTERVIEWS: PHYSICAL & TECHNICAL BARRIERS

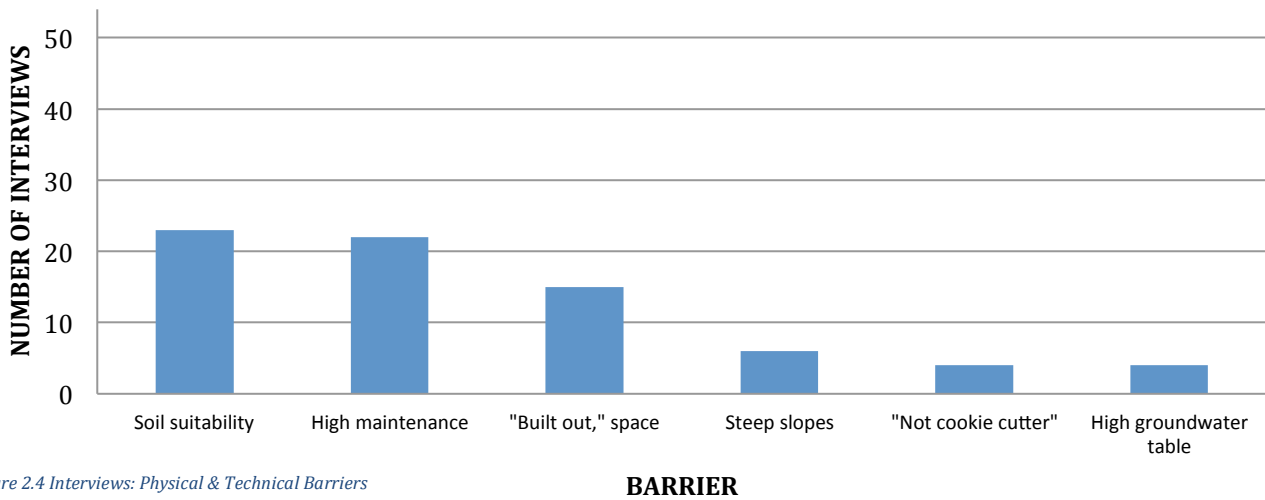


Figure 2.4 Interviews: Physical & Technical Barriers

### Legal and Regulatory

*“Well, codes aren't based on science at all. [laughs] Or common sense.”*

Forty-three of the NPDES reports mention legal and regulatory barriers. Conflicting codes and regulations constituted the most frequently mentioned barrier. This barrier came up in many different forms, and sometimes overlapped with other regulatory barriers, especially in the case of conflicting fire, safety, and ADA regulations. Many reports complained that LID and “where feasible” lack a clear definition, leading to general confusion and lost productivity. Lack of design manuals appeared as a common barrier. Even when municipal staff wanted to implement LID, out-of-date manuals resulted in confusion or reportedly contained insufficient detail. The permitting process is viewed as slow and expensive. Authors reported that the Department of Ecology’s LID credit calculation contained insufficient credits and lacked options for partial credits. A few reports suggested that the written code was not being enforced, primarily due to lack of personnel.

## NPDES REPORTS: LEGAL & REGULATORY BARRIERS

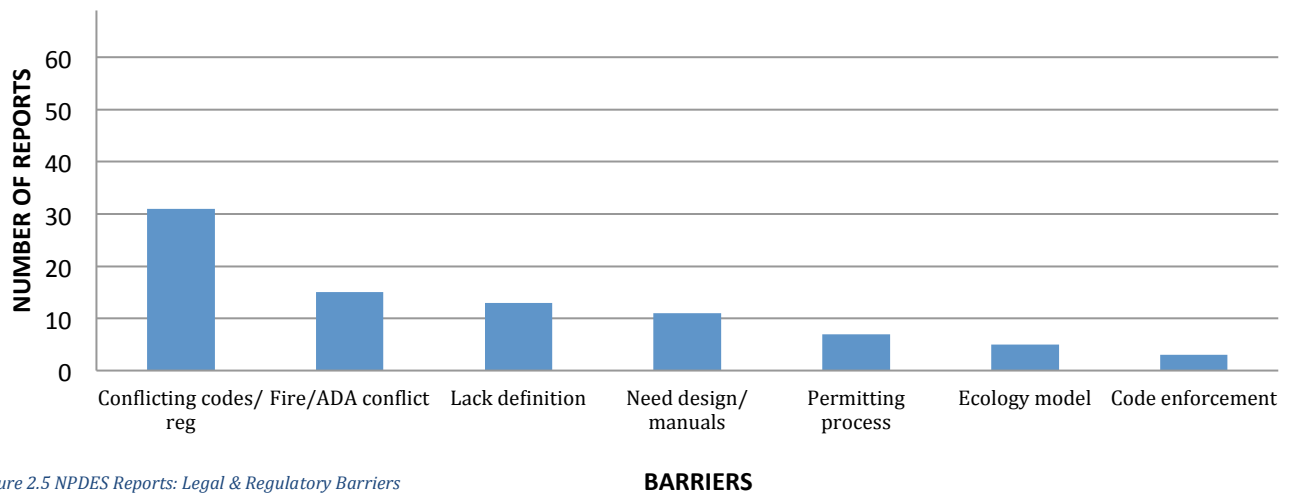


Figure 2.5 NPDES Reports: Legal & Regulatory Barriers

Conflicting codes and regulations appears as the most persistent legal and regulatory barrier in the interviews as well as the NPDES reports. Interviewees explain that codes may not be as practical as they seem.

*So say this is the – this is the stream, here's the bridge, here's the roadway. All of this is the floodway and the – so it's all in the 100-year flow elevation. Well, the shoreline code says it has to be three feet above the 100-year flood. Well if you did that then you'd have to do this whole road, you know, for hundreds of feet that would be in the flood plain and would be much worse than just maintaining that bridge at that elevation. And so – and they – you can do that but you have to then design the bridge so that it can withstand the forces that would be within the 100-year flood plain. So you can see how it could kind of defeat the purpose of the code to have hundreds of feet and thousands upon thousands of cubic yards in the floodway just to elevate it three feet.*

Accessibility can be an issue, “People think about ADA and does this certain porous pavement meet the requirements of that. There is some hesitation to some of that stuff.” Other times the desire to build green comes up against codes designed to protect human safety. A municipal airport employee reported, “Aviation safety is number one. If there is any chance of a conflict with a wildlife species, it won't be – LID or any aspect of a project, won't get approved. The risk is too high.” Other examples abound.

*Concern for people or safety risk often will trump the notion of a green idea. Oftentimes, perhaps, we want to put large woody debris in a river for a fish habitat. Well, if there's a bridge immediately downstream, then the wood could possibly rack up against the bridge and cause a concern for the bridge. It's a no-go. Line of sight around intersections—we have a large wetland on a corner, the road's been built right up to it, and if it grows trees and it blocks*

*someone's view, and someone could get hit, we'll know that, but there's not—green will quickly lose out to human safety. That's pretty consistent.*

Codes may be written for general scenarios rather than specific situations.

*So the other major thing that we deal with is that the codes are really developed for somebody putting in a subdivision somewhere, a polygon, but we have these long, linear things and we might have an increment of 10 percent on either side of them or something like that and everything is written for that other thing, and so we're always trying to put our square peg in the round hole.*

Changing and unclear mandates from FEMA illustrate conflicts with federal agencies.

*Now, FEMA is not a development agency, they don't issue permits, they don't – they're an insurance agency. So they have been reluctant to even be involved in how to move forward ... They left a great deal to the municipalities to figure out how to provide documentation for minor – let's say deck replacements or simple development ... I think now they're finally developing handouts five years later after the implementation, but in the interim we had no direction from the federal agency, just a requirement.*

Interviewees express frustration when the letter of the law is conflicting, unclear, or at a mismatch with the spirit of the law.

The permitting process appears as another common barrier discussed in interviews. An interviewee put it succinctly, "Every permit that you go through, the permitting process for each individual project, you just add six months to. So that's cost and cost and cost." Lack of local flexibility comes up less frequently overall but more often in more remote municipalities. "PSP overrides local priorities," said one interviewee. Another noted, "Anything ... that has a freeway on it doesn't pertain and actually will alienate people 'cause we're proud that we're not there." In both cases, municipal employees are asking for regulations that fit local situations.

Lack of code enforcement also appeared in some of the interviews. Staffing levels may drive some lack of code enforcement.

*It comes back down, I think, to staffing, even at the county level, as far as doing inspections and follow up, because there's surface water management division. They can only do so much. But you also need those folks on the ground, doing inspections, looking at things, and it's just – it's manpower. I don't even get a chance to – I mean, if you go out and do an inspection, there's quite a bit of paperwork you've got to come back and do, and if you're having to write ... an enforcement letter or a violation of lease letter, and then there's time with the attorneys, and well, is this person paying their rent? Well, they're paying their rent, we'll just let them be. You know, oh, they're not making enough money, cut them a break, you know, type thing.*

Interviewees mentioned that some code enforcement officers may be a barrier. "There's a code enforcement officer who – it's unfortunate, but most people just know that if you're a liberal, you're

going to have a problem with him, and if you're conservative, you're not. So. Yeah, there's definitely politics in there.” Other interviewees mention institutional malaise on enforcement.

## INTERVIEWS: LEGAL AND REGULATORY BARRIERS

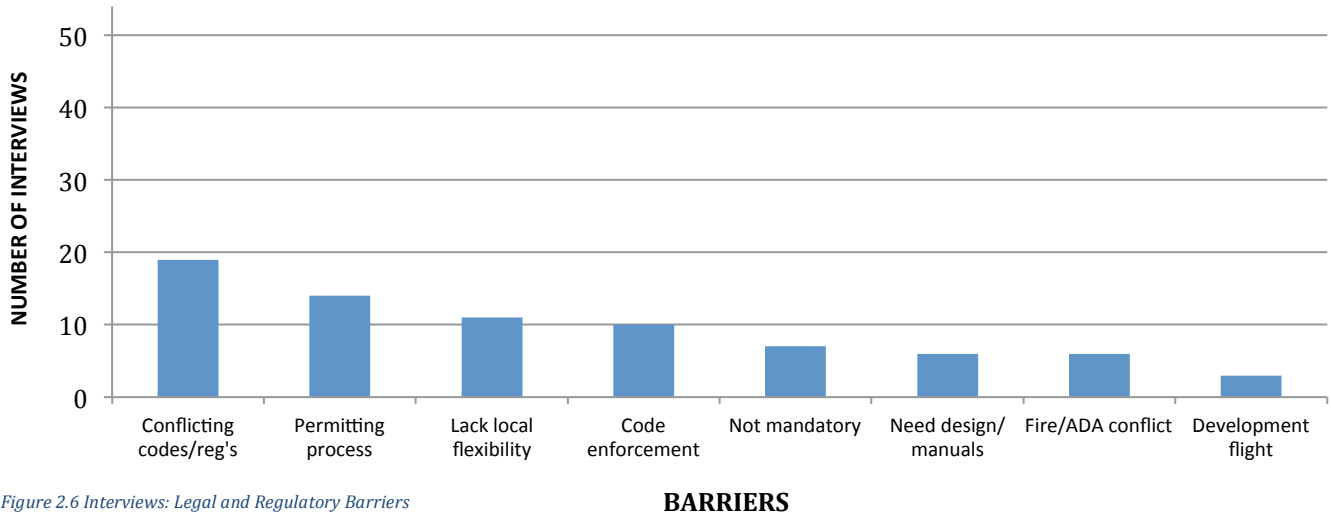


Figure 2.6 Interviews: Legal and Regulatory Barriers

Lack of mandatory LID appears as an occasional barrier. When asked what internal changes might help remove the barriers to the use of green infrastructure, an interviewee gave an emphatic one word answer, “Mandates.” Coworkers in a focus group talked about a comprehensive approach to Puget Sound recovery.

*The comprehensive approach, in my mind, it's a series of gears that are all the right size. So everything spins perfectly. Our existing programs have some huge gears and some really tiny ones and it's just not an efficient use of energy when you have a stormwater group and you don't actually have a climate adaptation group. I mean it's not that we're not working on it. It's just we don't have specific teams that are addressing that.*

A colleague followed up with, “And there's no way for us to push to get those teams if there's no requirement. Like, in the larger municipality, we can't say, hey, we need three more staff to hire to do this program on climate change, because there's no requirement for it. That's not gonna happen.” A few interviewees expressed their belief that more regulatory requirements would be an integral component of a comprehensive approach to Puget Sound recovery.

The need for design standards and manuals is an occasional barrier. An interviewee reported the burden this places on cities.

*Our standards have not been updated in quite some time, and so with the permit now... one of the conditions that we're going to have to start looking at this year ... is to update our development standards. ... Yeah and it's -- updating the standards is expensive and it's time consuming, either/or both... and so that's a big burden on the city.*



In this case updating the design standards and manuals is an issue of staff time and expense, leading to the topic of the next category of barriers.

An issue that came up in a couple of interviews was the flight of new development to neighboring jurisdictions where LID was not required. Both of the communities in which this issue came up were medium-sized cities with significant non-permitted small and/or rural jurisdictions in the vicinity. While infrequent among the interviewees, this situation is likely place specific and a product of the local situation where the goals of the Growth Management Act may conflict with NPDES permit standards.

### Financial

*“Well, now you’ve just increased the cost of a project because you’re doing 1) the pervious pavement and 2) you’re having to do a conveyance system in case it fails.”*

The most frequently mentioned financial barrier in the NPDES permit reports is known or perceived project cost. This includes the cost of pre-construction, construction, long-term maintenance and may include the cost of replacement for techniques with a short lifespan. The next most common barrier is risk/liability. Project failure is expensive both in terms of actual material, public perception, and the need for back-up systems. Another significant barrier is lack of data on cost/project maintenance. Not knowing how much something will cost in either the short term or the long run makes it difficult to set an appropriate budget, and makes municipal employees hesitant to install LID until these costs are better understood. Lack of or insufficient incentives receives mention. Desirable incentives include financial ones as well credit calculations. An interviewee provides clarification, “Whether you have permitting incentives through lower fees, through quicker review, through technical assistance. We’ll design your stormwater plan for your site, if you commit to installing these structures with clearly some limit of what the cost of those would be.” Another provides an example of financial needs, requesting “grant funds to support system wide municipal LID retrofits ... to go above and beyond stormwater program operation and maintenance activities.” According to the reports, incentives could be used more to help overcome the hurdle and risk of implementing these new and expensive techniques.

The most persistent financial barrier mentioned in interviews is also project cost. Cost comes upfront interviewees report, but potential savings tend to come over the longer term.

*On the development side it’s the significant amount of*

### NPDES REPORTS: FINANCIAL BARRIERS

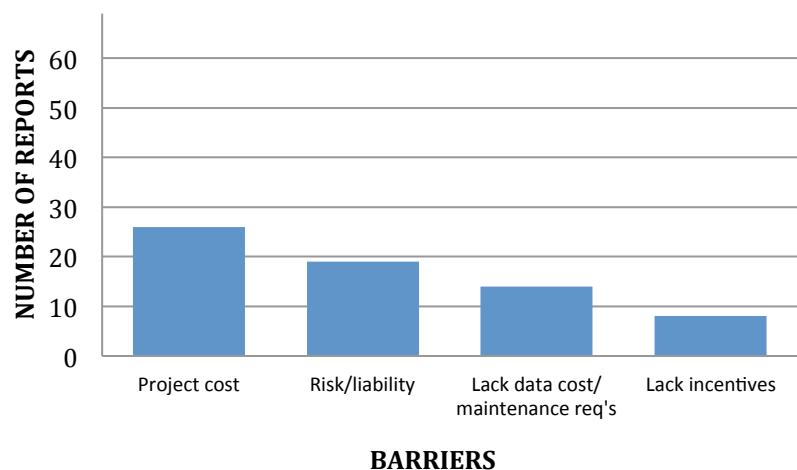


Figure 2.7 NPDES Reports: Financial Barriers

*cost of the installation and materials. If you look at the development cycle, if it's a spec building most developers have an initial cost and they arrive at the profit level through those initial costs by minimizing those. The long term cost savings that most green infrastructure provides isn't really conducive directly to their market price; so they don't have as much incentive. ... If it's a home owner or a long term owner typically the green infrastructure seems to be much more viable, a much more embraced alternative, because they reap the rewards from that longer reduced service cost from water, heat, electricity.*

In some cases, longer term cost, particularly for maintenance, is also an issue.

*It took me 12 years to get a second vector truck for this whole city ... because I think we kind of stepped back and looked at how much money they were putting into development and engineering side of things but they weren't putting any money back into the maintenance side. So we would get all this more and more stuff, and we don't have any more people to go out and actually do the work. So it took a long time for them to actually figure that out over there.*

When project cost is under discussion, maintenance equipment, risk of failure, and personnel often come up. Lack of data on cost and maintenance requirements is a persistent barrier, "The long term maintenance of some of these is not known. It's a good idea, and let's try this, but nobody knows the back end - how much it is going to cost to maintain the facility over time. It's - we struggle with that." Uncertainty leads to additional risk and liability.

*We're not sure exactly what those costs are gonna be long-term for us, so that's very difficult when we're trying to think about long-term planning, budgets. How much money do we, as a utility, need to have? What are our rates gonna be to pay for this? What are the failures gonna be of some of these techniques? You hope you don't have failures, but we have had failures in the past of some of the pervious pavements that we've done. Then, we have to go and replace them. That's not fun.*

Municipal employees also expressed a sense of betrayal because of early promises that green infrastructure would cost less and save money in the long run. During participant observation, an engineer with a large city expressed his frustration, "LID was presented as the next best thing, cheaper to build and maintain. This is BS!" LID, he said, "came from Surface Water people who didn't understand how streets work." Cost is widely perceived as a barrier to implementation of green infrastructure. Lack of data, uncertainties, and time required for benefits to accrue appear to contribute to this perception. Interviewees, though, give little attention to the comparative cost of vaults and detention ponds and the related maintenance of grey infrastructure.

## INTERVIEWS: FINANCIAL BARRIERS

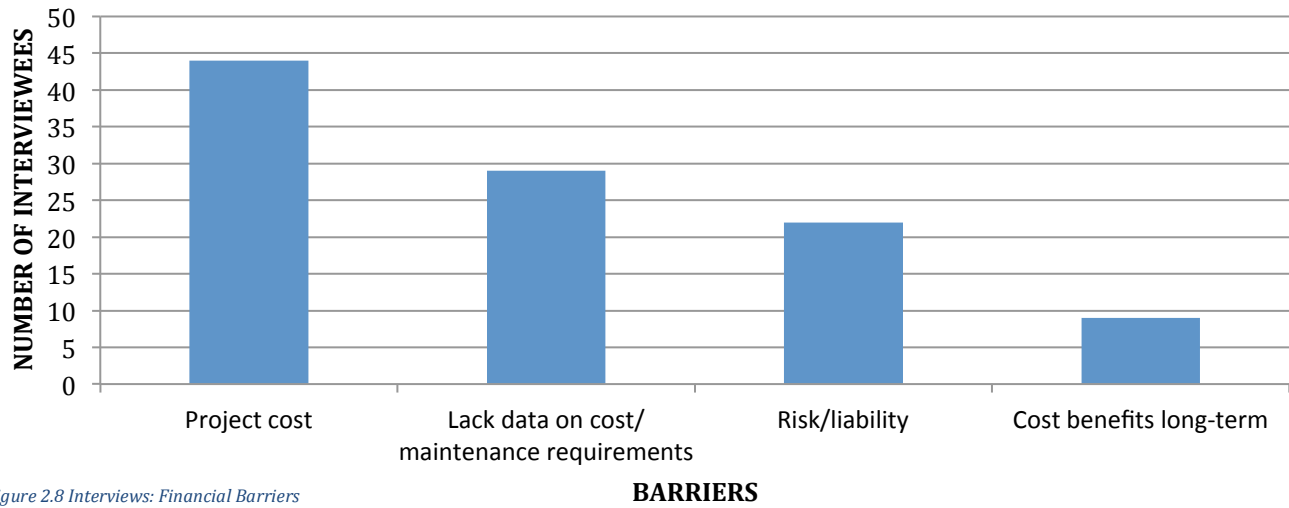


Figure 2.8 Interviews: Financial Barriers

### Community and Institutional

*“I think I can only count on one hand how many projects that I’ve seen where our county engineer said, ‘Really look at LID for this particular bridge,’ you know? Most of the people that have been here a long time, they do what they’ve always done, you know? And if you try to suggest more innovative ways, you—half may listen, half may not. So it all goes back to what is out there and who should we educate—the county [elected officials], the legislators here? ... And then it would trickle down to the directors where they would say, “This is important. This is important to our county leaders, and so this is important in our department.”*

In NPDES reports, municipal staff presented a lack of public demand as the most persistent community and institutional barrier. The public may view LID as expensive, a breeding ground for mosquitos, risky, aesthetically unpleasant, or conflicting with other priorities such as parking space. The next biggest barrier reported is a lack of staff training. Municipal employees may not know how to implement certain LID techniques or be aware of their cost and benefits. More than 20% of reports mentioned insufficient staff time and internal resistance as barriers. Staff lacked time to go to trainings, even when trainings were available. Municipal staff resistance to changing their methods and implementing a new technique receives repeated mention. A few reports mentioned lack of internal communication as a barrier. Reasons mentioned for resistance include that even when implemented, staff lacked the means and know-how to maintain the LID facility, had heard of LID failures and were afraid to take the risk, or viewed LID construction as prohibitively expensive. Ownership of facilities and responsibility for maintenance appears as a frequent barrier. Location of on-site stormwater facilities on private property also complicates maintenance and enforcement. More barriers include elected officials, conflicting priorities for time, funding, space or ideals such as safety. External

resistance may be due to perceived cost, risk, or conflicting priorities and lack of skilled contractors to turn to for technical assistance. With a shortage of skilled contractors, there is no reportedly no competition to drive down the price.

### NPDES REPORTS: COMMUNITY & INSTITUTIONAL BARRIERS

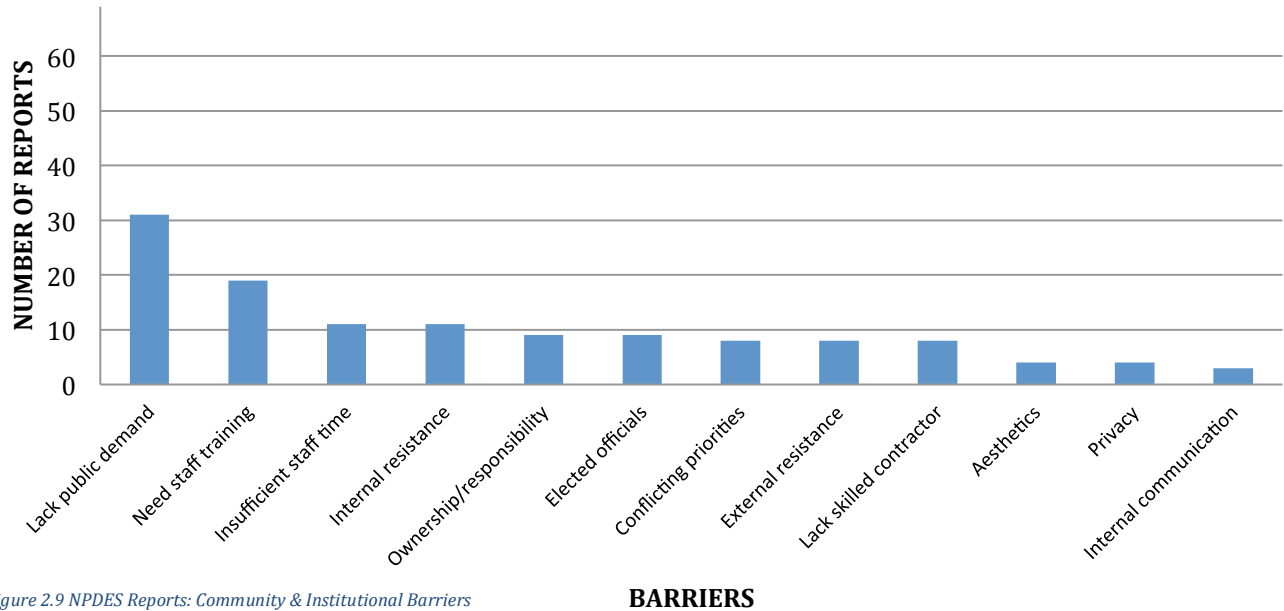


Figure 2.9 NPDES Reports: Community & Institutional Barriers

Five persistent community/institutional barriers appear in the interview transcripts: need for more staff training, internal resistance, lack of public demand, conflicting priorities, and insufficient staff time. Lack of staff training is a challenge for implementing green infrastructure according to one interviewee from a small, rural jurisdiction.

*It's not just the financial resources. It's the personnel... Yeah. And that's both within the utility and within our regulatory structure. So where we do have requirements for treatment like in applying the Western Washington Manual, those kinds of things, the people that end up having to check up on that, they have neither the time, the training, and it's usually not a direct part of their job, so it's something that gets added to their other duties. It's like the building inspectors checking on a rain garden treatment... I think it's part of — I think it's related that they're hired to do a job and that's the job they were trained for and that's the thing that motivated them in the first place to spend time working for government, and then they get this other thing that's added on, and they don't ... have ... the education or the perspective to understand what it's there for. It's one more pass they have to do and not something they see as central to their duties.*

## INTERVIEWS: COMMUNITY/INSTITUTIONAL BARRIERS

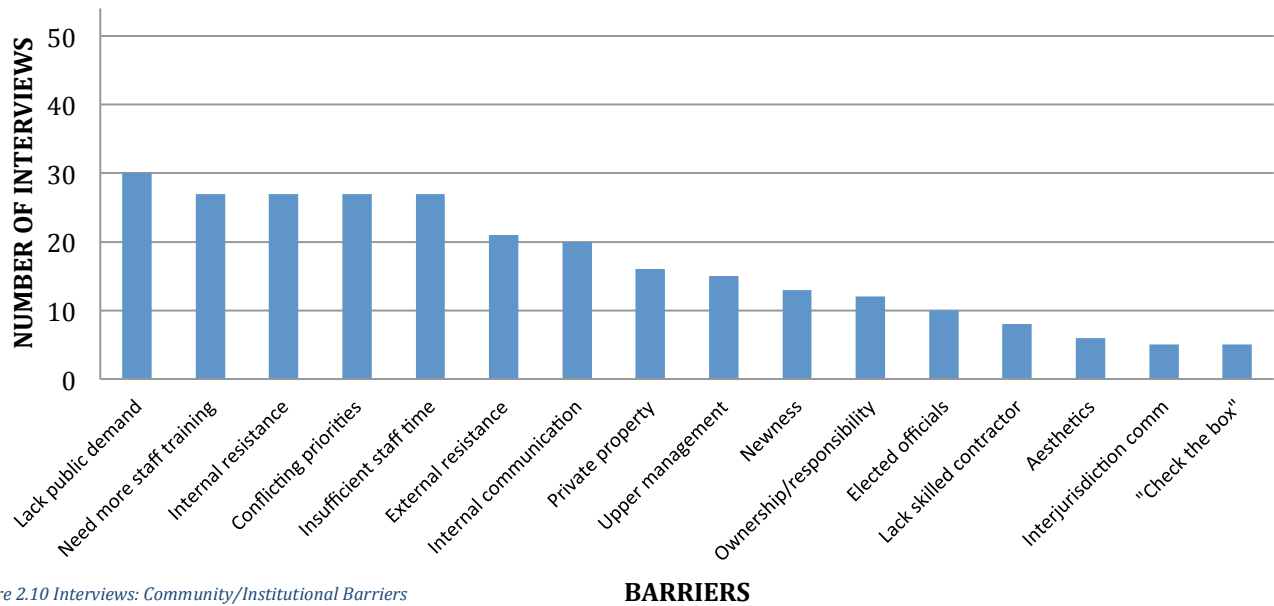


Figure 2.10 Interviews: Community/Institutional Barriers

A reported lack of public demand appeared as a persistent barrier in the interviews.

*Things like rain gardens are a little bit different, but there's also a little bit of hesitancy from some staff to move forward related to things like rain gardens because of some bad PR issues that happened in other jurisdictions or other jurisdictions that didn't design them or develop them correctly and as a result don't work and then made a statement about that.*

Failed projects reportedly have had a widespread negative influence on both staff and the public but it is curious that the failure of detention ponds, of which there are many, are not reported to have had a similar impact on preference for grey infrastructure.

It is worth noting that our participant observation failed to support the consistent claims of lack of public demand from both the NPDES permit reports and the interviews. In our attendance at community consultations for public projects involving green infrastructure we consistently observed community members overwhelmingly exercising preference for the greenest options, requesting more attention to long-term impacts of sea level rise and climate change, and demanding that different jurisdictions and municipal departments better coordinate efforts to address stormwater issues at their source, not just their symptoms. While our observations constitute a small sample and were limited in geographic scope, they raise questions about the reliability of some claims for lack of public support, at least in large, urban settings where most of our observations of community meetings took place. Our participant observation should be tempered by the fact that survey respondents rated "Lack of public demand" as the 11<sup>th</sup> highest of 40 barriers (see below). Regardless, it is clear, that municipal employees believe that more public demand for green infrastructure is important to its implementation as illustrated in this quote.

*I'd love to see the public make a bigger deal. More education for the public on how they can sort of push the county – I'm gonna talk just for the county – to do the right thing, you know, and to protect their quality of the environment, their waterways, to get the fish back or restore the habitats and, yeah, protect them too. I just – because they listen to the public. It's amazing some of the silly projects we end up with because the public has gotten the ear of their council member.*

Municipal employees reported trying to balance many, important, and conflicting priorities without sufficient time to implement comprehensive approaches to Puget Sound recovery. Conflicting priorities may come from co-management of a waterway between two different jurisdictions, as illustrated during participant observation when an engineer described a large city that managed a “ditch” for water quality, while the county managed it for flood control. Other conflicting priorities may be internal to the municipality or the project itself.

*We try to make our right-of-ways as narrow as possible and not have to buy additional right-of-way from adjoining property owners because that's expensive and difficult. That's more of a city situation. If you're looking at a subdivision with new roads, obviously that's a little different. It would mean that our right-of-way is wider if we need to have swales that are 15' wide or something like that. Or, you're taking out a bike lane. Or you're taking out something else. You're taking out a parking lane. There's just a lot of competing needs.*

One respondent in a focus group reported, “Most everyone comes to work and does their job and goes home at the end of the day.” When asked how to improve the situation, he replied.

*Boy. I think some of that would go back to the time and the resources that you have to implement the job. For the [elected officials] to have this vision and to share that with the upper management and how it was all coordinated, and how they saw us achieving some of those— ...it would come down to dedicating time and resources to making that communication happen. It really needs to; time needs to be set aside. And it's not—in fact, we're actually told we need to be charging our time to projects, and you're limited on the amount of admin or operations that you should be charging your time to, and it's looked at and considered. We were given a very small allotment of time to be working on anything but a product with a charge code and a budget and just government operations and keeping everyone informed as a pie in the sky notion, or an unfunded mandate.*

Time for communication, interviewees report, is clearly limited. This can contribute to another common barrier of internal communication.

A focus group of city employees responsible for behavior change programs in their large jurisdiction addressed missed opportunities because of lack of communication and coordination.

*It's demonstrated in some kind of a training how valuable education, outreach and including behavior change outreach is to a project running smoothly, softening the ground for a project so*

*that you have less work for yourself then on the day of, someone called and you have to respond to issues that come up... if we could work out our workload in advance – instead of having to fly by the seat of our pants.*

*'Cause what we're realizing is, if a road construction project goes in, that is one of the biggest ways we can get people's attention. That's a huge hook for the residents that live in that area. And that's a great way for us to open the conversation about green infrastructure on their own properties or other ways that they might be involved in community level green infrastructure. And so, if we can capitalize on that opportunity, then we can get a lot more done... If they understood the process a little bit better, I think they'd ask us for things earlier and we could plan ahead for it instead of finding last minute requests.*

These two staff feel like their voice isn't being heard within the larger context of their municipality. They are not alone. In participant observation and multiple interviews, generalizations about different ethics and subcultures of engineers, stormwater staff, and planners abound as illustrated here in a statement from a city manager, "This goes back to, again, I believe a self-selection bias for planners that do not work well with others, do not play well with others, and so I have just had extensive problems with my planners here." Other perceptions across professional expertise are evident in the statement, "Some engineers need to get their rear ends out of the chair and into the field!" While the finger may be pointed in various directions, poor communication among various department and divisions is a commonly mentioned barrier to green infrastructure implementation.

Upper municipal management and state agencies are often cited as part of the problem. A focus group with planners outlines the challenge from their perspective.

*This is what I learned in planning school. Everybody gets focused on doing things right instead of doing the right thing. We would like the focus on doing the right thing rather than doing things right the way everybody is in their little boxes. We have that with management here and the agencies. Yes, I mean it happens at every level.*

While one interviewee seems to believe that "check the box" versus doing the right thing can happen at every level, the other interviewee places barrier in the hands of upper level management and "the agencies." An interviewee in a focus group that combined middle and line staff also reported that upper level management and agency compliance is where ideas encounter obstacles.

*We usually bump heads quite a bit on when our, when my staff has an idea or they know of something that's being done in other states and we want to be able to emulate that. However, say the state is kinda lagging behind telling us exactly what we should be doing or whatnot, we try to be innovative in house, but then we would have to have management buy in, and do we have funding for that? Is it required, who's requiring it? And if we find that, it could be a great idea, but if we're finding that there's nothing that gives us the actual prescription to do it, the code to do it, we may not get there, so. Again, it's all about the bottom line and what are the requirements to getting the overall permit.*



Checking boxes, line staff and middle management report, is reportedly far more important to upper management than innovative planning and design of green infrastructure. Intriguingly, in our interviews with executive staff most represented themselves as forward-thinking leaders on environmental issues and their municipalities as exemplars of green infrastructure implementation.

Ownership and responsibility for green infrastructure gets repeated mention as a common barrier. An informal interviewee observed that the transportation department puts in porous sidewalks but has no clear plan for maintaining them, meanwhile responsibility gets passed around internally. Another interviewee shares that rental property can also present a barrier.

*The renter might really want to do a native planting project or a rain garden and I might be able to talk them into it and get them up to a level of great knowledge. But then they have to call their landlord and convince their landlord to let them do this project... And I don't actually have the right, I guess, or the ability to just call that landlord up and say, okay, so I was talking to your renter today and here's what we talked about. Can I convince you to do this on behalf of your renter? It's not an illegal thing to do, but it's not really within the normal protocol for me to cold call somebody and say that I'm working for the city on behalf of your tenant to try to do something on your property while you're not there. It just doesn't quite match with the way that we normally communicate with people. So that barrier there is just lack of access to the actual owner of the property and lack of face-to-face interaction with them.*

There is a widespread understanding by municipal employees that public involvement is a necessary component of successful green infrastructure implementation, “Treatment areas, [we] often put some on private property. There’s a lack of access and rights for inspectors to maintain them and then who maintains them? Who’s responsible?” Concerns abound related to putting stormwater structures on public and private property without a clearer understanding of who is responsible for the long-term maintenance required for the facility to operate effectively.

Elected officials, lack of skilled contractors, inter-jurisdictional communication, and aesthetics are occasionally mentioned as barriers. “There's – I would say there's a conservative bent right now with the council and also the council just previous to this one. So there's been a huge struggle to pass environmental regulation.” When asked about the challenges faced by the municipality in the implementation of green infrastructure, an interviewee identified lack of technical knowledge among contractors as one of the top two.

*I think there's probably many, but let's jump to probably what I think of as the top two. First one is money... There's only a limited amount of money, so a low-cost solution is usually chosen even if the long-term costs are higher than the front-end cost. The other challenge with a lot of what I term green infrastructure in this area is one of technical knowhow. Either technical knowhow of the designer but particularly of contractors, the people in the construction business who have not had a lot of practice installing new systems and don't always get it quite as designed, or know where the corners can be cut and where they can't.*

When asked how an interviewees' own jurisdictions efforts compared with a comprehensive approach to restore the Puget Sound , they emphasized past communication lapses between the Department of Ecology and municipalities despite efforts to facilitate dialogue.

*Well, from what I've seen and been working with over the last few years, there is the comprehensive approach in that Ecology is issuing the regulations that we have to comply with so we're working to do that. But again, it hasn't really been as collaborative as I think it could have been and I think would have worked a little better perhaps... Yeah. And I do know that early on there were two committees convened – a technical committee and I forget what the second committee – you know, with representatives from cities, counties – Ecology did this when they were in the early stages of developing LID requirements. But they're really – at least I was not aware of any communication from those technical committees to the jurisdictions. I mean they had some representatives there but there wasn't the kind of dissemination of information from those committees out to the jurisdictions saying, "Here's what we've done, here's what we're thinking, here's what we're going to have to do." You know, Ecology ended up issuing this stuff and basically saying, "Well, these people approved it. So get on board." You know and everyone is looking – who decided all this stuff? You know, it's not gonna work in the XX county region, not because we don't want to but because our soils are different than down in XX County. I think if there had been more collaboration, more involvement, I think people would have felt more acceptance of what was done initially and we're working through that now but it could have just occurred much earlier.*

An interviewee explained how aesthetics could add burdens to maintenance of porous pavement and bioretention facilities.

*We found that some of our porous pavements grow moss and things like that and we don't really have effective ways of cleaning them and maintaining them. The other things we've found is bio-retention works – we find it works well. But we don't really have the expertise to make them look pretty. So we're trying to – well, can we make them more natural looking? Can they be mow-able? Can they just be a natural area rather than just being this pretty thing with plants in it that looks like a landscaped area. So I think the biggest one is maintenance.*

Community and institutional barriers are many and complex. While lack of public demand appears prominently in NPDES reports and interviews, participant observation raises questions about whether or not deeper issues may be at play here. The desire for more public engagement is widespread and may help make it easier for elected officials, municipal management, and staff to implement green infrastructure. Internal and external resistance, coupled with conflicting priorities, are part of the challenge facing municipal employees. Internal tensions and poor communication between different departments and divisions appear to impede effectiveness. Availability of more skilled contractors and changing aesthetics also may slow some implementation of green infrastructure.

## Barriers in Survey Responses

*“BY FAR the biggest concern I hear from clients is uncertainty about long-term performance and private maintenance of systems, and cost/effort of performing inspections and maintenance in perpetuity for hundreds/thousands of small, distributed systems. There is serious concern that LID facilities are not robust (i.e., will not perform past the first few years) and will create an inspection and maintenance nightmare.”*

*“Many municipalities feel like they're being used as guinea pigs, required to install small, distributed systems whose performance (particularly for water quality impacts to surface water and groundwater) is unproven and uncertain.”*

The data set generated by the survey enables us to rank the frequency with which municipal employees report encountering forty known barriers within their jurisdictions. Survey question #7, for example, requested that respondents use a four-point Likert scale to indicate the frequency with which they encountered a list of barriers. We scored the frequency options from 1 – 4 with the higher number indicating greater frequency, enabling the generation of descriptive statistics. These scores appear in ranked order in the table below descending from the largest mean to the smallest.

### **Q7. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction.**

- 1 – Not a Barrier
- 2 – Infrequent Barrier
- 3 – Common Barrier
- 4 – Persistent Barrier

*Table 2.1 Descriptive Statistics: Barriers to green infrastructure implementation: Item Q7*

Item	N	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	145	3.16	.926
Q7.03 MAINTENANCE AND DURABILITY	146	3.09	.846
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	144	3.03	.908
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	130	3.00	.956
Q7.04 PROJECT COST	145	3.00	.905
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	136	2.99	.985
Q7.05 INSUFFICIENT MUNICIPAL STAFF	147	2.99	1.040
Q7.01 SOIL SUITABILITY FOR INFILTRATION	150	2.98	.901
Q7.17 PROPERTY RIGHTS CONCERNS	135	2.75	1.020
Q7.06 STAFF NEED MORE TRAINING	150	2.73	1.003
Q7.22 LACK OF PUBLIC DEMAND	132	2.69	.966
Q7.07 RISK/LIABILITY	122	2.65	.953

Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	144	2.63	.995
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	120	2.63	.870
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	137	2.58	.944
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	115	2.56	.966
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	143	2.52	.977
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	147	2.52	1.094
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	135	2.51	.905
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	145	2.51	1.055
Q7.34 MANAGEMENT VISION AND PRIORITIES	147	2.50	1.043
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	140	2.49	.956
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	132	2.48	1.088
Q7.19 INSUFFICIENT IMPACT FEES	110	2.47	1.055
Q7.36 LACK OF AVAILABLE SPACE	149	2.47	1.004
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	114	2.46	1.023
Q7.24 PUBLIC RESISTANCE	132	2.46	.960
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	131	2.29	1.019
Q7.39 INSUFFICIENT MANDATE FOR LID	138	2.26	1.076
Q7.21 LONGER PROCESSES FOR PERMITTING	131	2.24	1.022
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	128	2.23	.941
Q7.15 PROJECTS TOO SMALL AND DISPERSED	133	2.23	.966
Q7.10 AESTHETICS	143	2.22	.905
Q7.29 INTERVENTION BY ELECTED OFFICIALS	124	2.21	.957
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	96	2.07	.932
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	137	2.00	.822
Q7.38 SPILL AND POLLUTION PREVENTION	134	1.93	.890
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	131	1.84	.867
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	112	1.71	.832

### SURVEY: TOP FIVE BARRIER MEANS FOR CITY & COUNTY

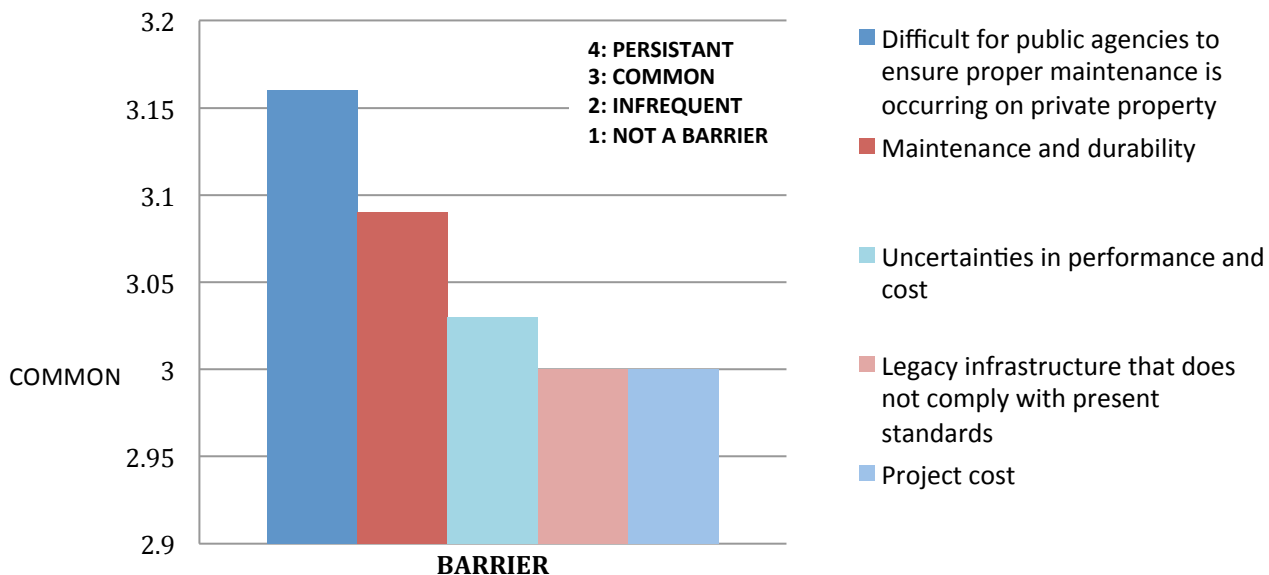


Figure 2.11 Survey: Top five barrier means for city & county

The top five barriers all had means of 3 or above, indicating the average respondent ranked these as common to persistent barriers. The top ranked barrier is “Difficult for public agencies to ensure proper maintenance is occurring on private property” (Q7.30). Next is “Maintenance and durability,” (Q7.03) followed by “Uncertainties in performance and cost” (Q7.25), “Legacy infrastructure that does not comply with present standards” (Q7.32), and “Project cost” (Q7.04). The next thirty-one barriers all had means between 2 and 2.99, indicating the average respondent ranked these as infrequent to common barriers. The next five items in this category include “Restrictions on spending public money on private property” (Q7.13), “Insufficient municipal staff”( Q7.05), “Soil suitability for infiltration” (Q7.01), “Property rights concerns” (Q7.17), and “Staff need more training” (Q7.06). The bottom four barriers had rankings below 2, indicating the average respondent ranked these between not a barrier and infrequent barrier. The bottom barriers are “Spill and pollution prevention” (Q7.32), “Guidance available is not relevant to this municipality” (Q7.09), and “New development is moving to neighboring jurisdictions where LID is required” (Q7.14). Maintenance issues, especially those involving private property, clearly rise to the top, followed by legacy infrastructure and project cost.

The comments section for this question provided respondents with an opportunity to clarify or add items. One responded emphasizes, “Many of the barriers listed are barriers due to the perception they are a problem as opposed to the reality which is less restrictive.” One respondent contested the wording of a particular barrier, “‘Initial costs are short-term, while economic benefits are long-term’ is a false statement. It not only costs more to construct, but it also costs more in the long run to maintain as we need additional staff to perform the necessary inspections.” Most of the comments expanded upon or clarified existing items in the survey but a few could be considered additional barriers. These include “I am also concerned about maintaining public utilities under pervious asphalt,” “Overwater infrastructures do not lend to LID as well as land based” and “Minimal development drives minimal change.” Indeed, ferreting out the difference between perceptions of barriers and actual barriers is a challenging one.

Issues related to maintenance appear most prominently as frequent barriers from aggregate survey respondents. Of particular concern is the difficulty public agencies face in ensuring proper maintenance is occurring on private property and associated uncertainties in performance and cost. The existence of legacy infrastructure that does not comply with green infrastructure standards and project costs are cited as common to persistent barriers. Barriers reported to be less frequent in most municipalities included spill and pollution prevention, lack of local guidance, and the movement of development to neighboring jurisdictions where LID is not required.

### **Patterns of Barriers Across and Within Jurisdictions**

*“Many municipalities feel like they're being used as guinea pigs, required to install small, distributed systems whose performance (particularly for water quality impacts to surface water and groundwater) is unproven and uncertain.”*

The next set of research questions addressed here ask for the identification of patterns across and within jurisdictions.

9. How do the perceptions of barriers compare and contrast between cities and counties? Between large, mid-sized, and small jurisdictions? Between urban and rural jurisdictions? Between stormwater permittees and non-permittees?
10. How do perceptions of barriers vary between executive staff, middle managers, and line staff?
11. How do perceptions of barriers vary between staff in planning, permitting, public works, stormwater, and natural resources?

We can answer these questions about patterns of barriers across and within jurisdictions with a summary of results from our descriptive statistics broken down by demographic variables. An Analysis of Variance (ANOVA) helps identify significant differences. The significant differences are discussed in narrative form below and interested readers are invited to review the ANOVA data more closely in Appendix J and the descriptive statistics in Appendix K. Interpreting both will be facilitated by using the list of item/variable codes from Appendix G.

Figure 2.12 Survey: ANOVA Statistically Significant Variations: city vs. county barriers (Q1:Q7)

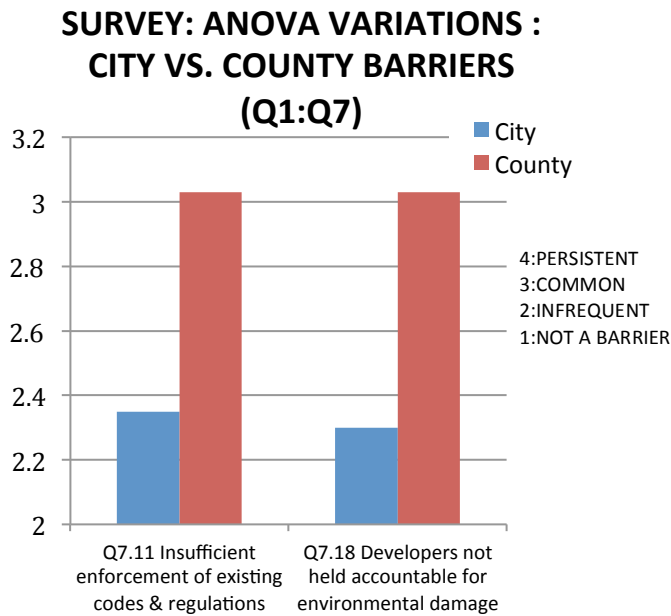
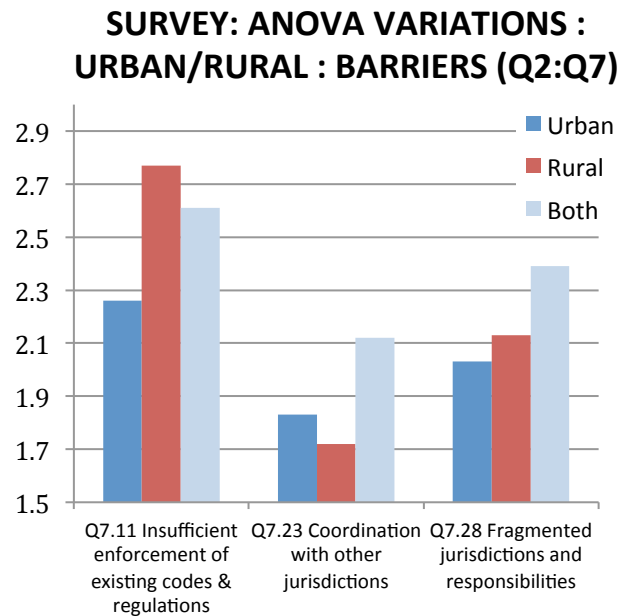


Figure 2.13 Survey: ANOVA Statistically Significant Variations: urban vs rural: barriers (Q2:Q7)



While most differences in ranking of barriers appear to be statistically insignificant some key differences across municipality characteristics emerged. Insufficient enforcement of existing codes and regulations and not holding developers accountable for environmental damage are more frequent barriers in counties than in cities. Insufficient enforcement is more of a barrier in jurisdictions that include rural areas versus those serving only urban areas. Coordination with other jurisdictions and the fragmentation of responsibilities are more frequent problems in municipalities that serve both urban and rural areas than in ones that serve just urban or just rural constituencies.

**SURVEY: ANOVA  
VARIATION:  
JURISDICTIONAL SIZE :  
BARRIERS (Q3:Q7)**

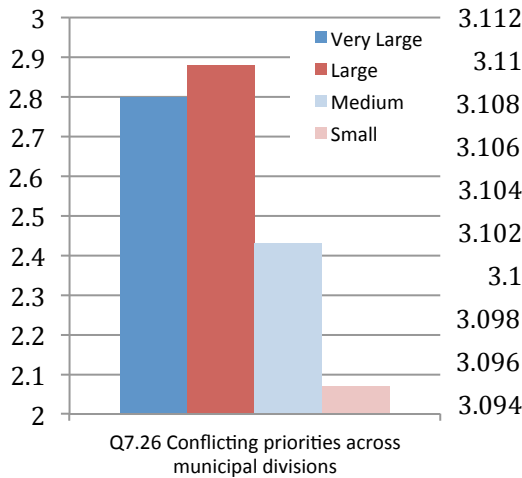


Figure 2.14 Survey: ANOVA Statistically Significant Variations: jurisdictional pop. size (Q3:Q7)

**SURVEY: ANOVA  
VARIATIONS: NPDES  
STATUS: BARRIERS  
(Q4:Q7)**

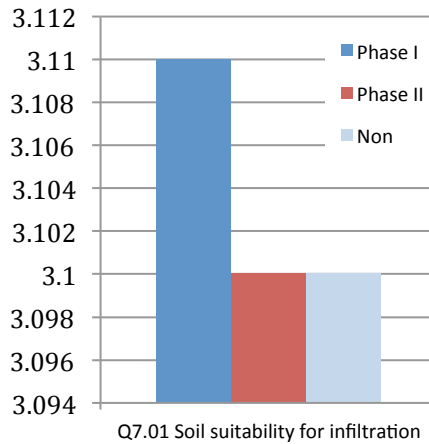


Figure 2.15 Survey: ANOVA Statistically Significant Variations: NPDES status: barriers (Q4:Q7)

**SURVEY: ANOVA:  
REGIONAL VARIATION  
FOR BARRIERS (Q5:Q7)**

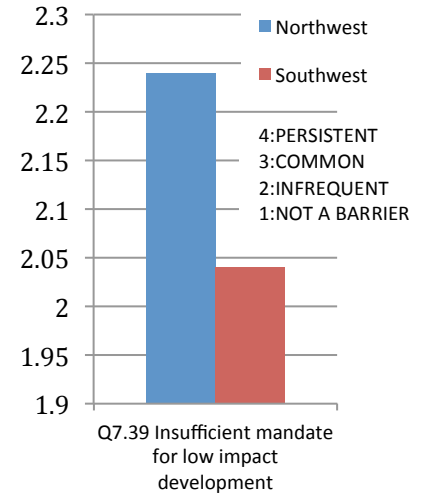


Figure 2.16 Survey: ANOVA Statistically Significant Variations: regional variation: barriers (Q5:Q7)

Conflicting priorities across municipal divisions plague very large, large, and medium-sized municipalities much more so than small ones. Soil suitability for infiltration is more of a barrier for Phase I than Phase II and non-permitted jurisdictions. Municipal employees in the Department of Ecology’s Northwest region found an insufficient mandate for LID to be more of a barrier than those in the Southwest. Other barriers did not vary significantly by municipality type.

Hierarchical position had some influence on the frequency with which respondents indicated the presence of a few barriers. Line staff were much more likely to view municipal staff resistance to change as a barrier than were middle and executive management. Executive and line staff reported fragmented jurisdictions and responsibilities, management vision and priorities, and unequal ability of some social groups to access incentives as larger barriers than middle management.

**SURVEY: ANOVA VARIATIONS :  
HIERARCHY: BARRIERS (Q11:Q7)**

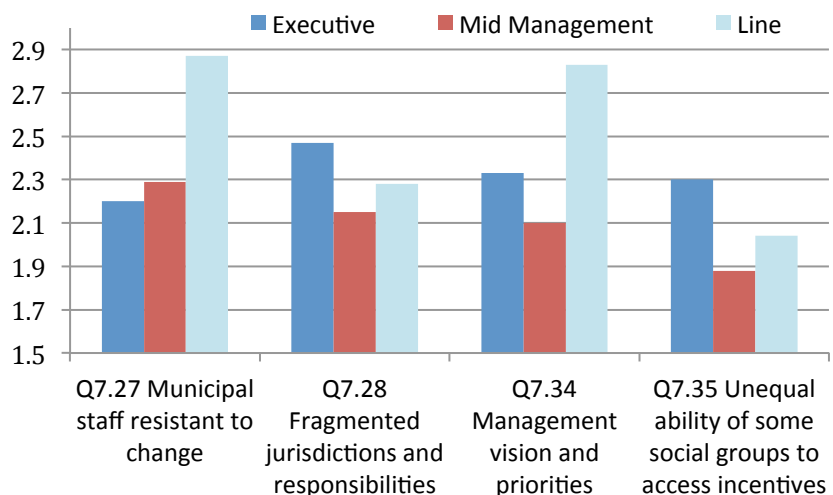


Figure 2.17 Survey: ANOVA Statistically Significant Variations: staff hierarchy: barriers (Q11:Q7)



Perspectives on the top barriers also varied somewhat by municipal departments and divisions. Intriguingly, staff in maintenance and engineering rated difficulties for public agencies to ensure proper maintenance is occurring on private property as less of a barrier than other employees. Employees in surface water management were more likely to see legacy infrastructure and uncertainties in performance and costs as greater barriers than those from other departments. Planning and engineering departments were more likely to view insufficient staff as a barriers. Overall, though, there was strong consistency across departments in the recognition of key barriers.

### DESCRIPTIVE STATISTICS TOP BARRIERS (Q7) BY MUNICIPAL DEPARTMENT

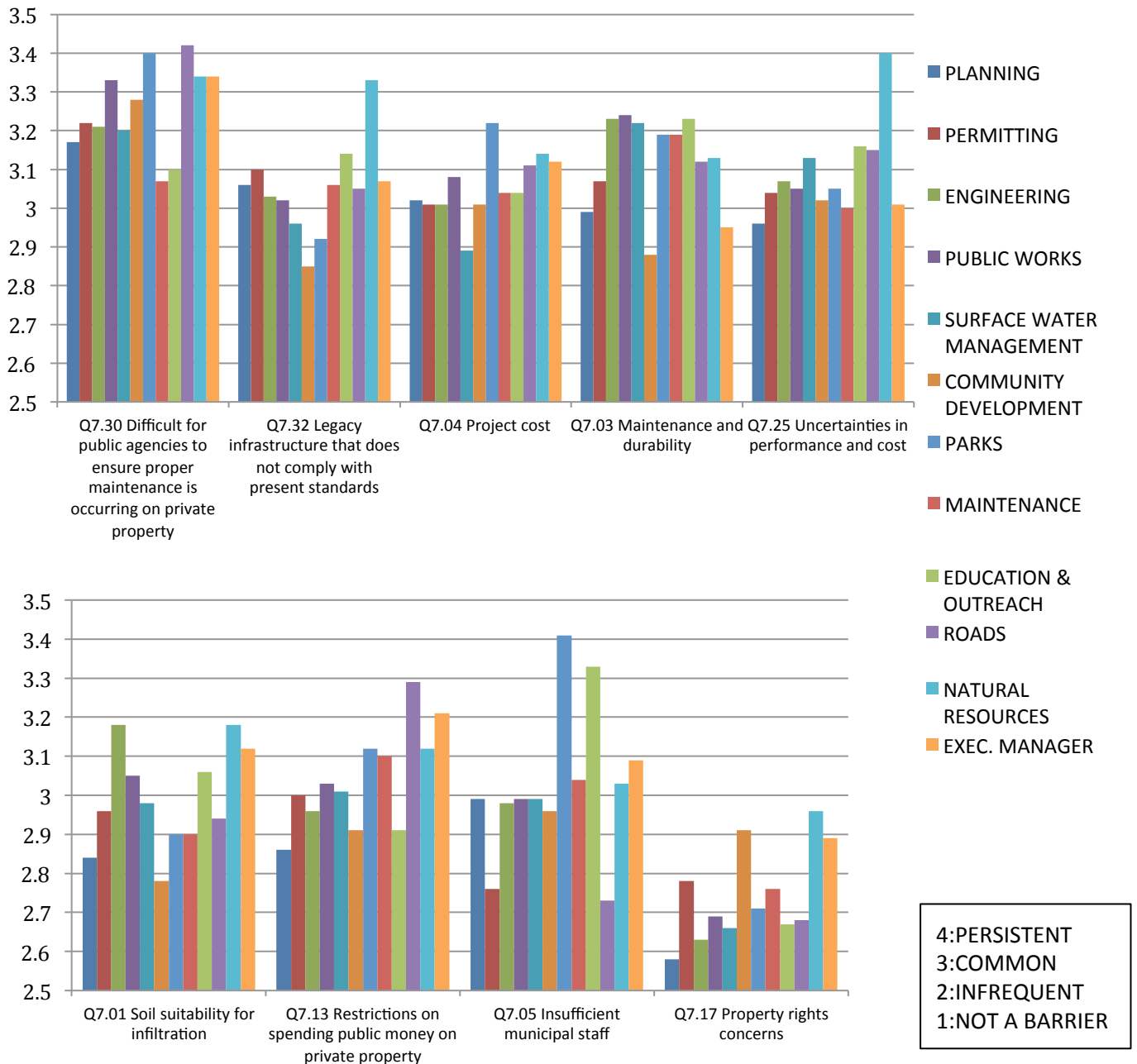


Figure 2.18 Survey: Descriptive statistics of top barriers by municipal department

## Solutions for Green Infrastructure

A summary of data on proposed solutions to the barriers described above address two more research questions.

7. What internal changes might remove those barriers?
8. What kinds of external support could remove those barriers?

Following the work of Clean Water America Alliance (Abhold et al., 2011) we have again organized and analyzed our results from the document analysis and interviews under four primary categories: technical and physical, legal and regulatory, financial, and community and institutional. Following a summary of patterns under these categories we examine responses from the general survey audience to identify ranked frequencies for identified solutions.

### Physical and Technical

*“I think a dedicated team for LID that goes beyond design and planning and gets into maintenance and inspection is needed to make LID successful over time.”*

The most common physical solution proposed in the NPDES permit reports is to evaluate site by site, and implement LID technique in appropriate locations. The next most common solution is to have a map showing feasibility of infiltration techniques based on hydrology and/or soil type, or to come up with a standard easy to use on-site suitability test. A map of soil suitability or development of a quick suitability test would reportedly make it easier to determine with minimal effort whether a specific technique would be feasible on a particular site location. One of the current challenges reported is that there are multiple soil suitability tests that often give conflicting results. There is not one standard go-to test for soil infiltration. Several reports also mentioned simply using a different technique where another LID technique would not be suitable, for example choosing a non-infiltration technique in an area with poor soil suitability. One occasional solution in the reports mentioned that physical monitoring of LID performance over time would be useful to fill in the lack of data on maintenance requirements and longevity. More financial data on cost and maintenance requirements was considered separately under financial solutions.

The most common physical solutions mentioned in interviews were to evaluate site by site and implement green infrastructure techniques where feasible followed by using another LID

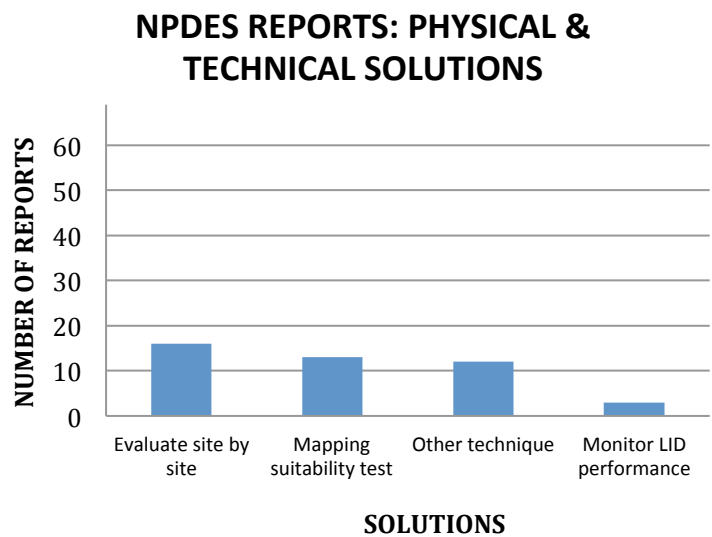


Figure 3.1 NPDES Reports: Physical & Technical Solutions

technique. Site-specific issues limit options as noted in the following quotes.

*With the kind of operation that we deal with here at our location, the attraction of large water fowl is a safety issue ... but because of that, for example, the advance wetland mitigation that we did, we went far enough away from our location that we could create open water habitat that attracts large water fowl and doesn't create a safety issue for us here. So that's the reason that we distanced it off-site. Then the wetland mitigation that we created on-site was a low depth of water that allowed dense vegetation to grow. That doesn't attract large water fowl. So that was an example of how we could do it on-site and how we did it off-site.*

This is just one example of how sites can be evaluated to come up with suitable low impact solutions. The creation of a toolbox of performance standards can be helpful as one interviewee noted.

*The issue is more that they don't understand why they're doing the work and they don't think that the solution they've been asked to use is viable in the situation they're in. So low impact in dealing with storm water for instance, infiltration trenches where there's no infiltration possible. So they're presented with a solution. They're either on solid rock or in clay. They know that's not going to be workable, but it's the one they've been told to put in. And that – we run into that quite a lot. We have – our geology here is very mixed. I think there needs to be a toolbox of good methods. I don't think we have that yet.*

Maps may be an integral part of that toolbox.

*Maps – that's what people want. We've done outreaches at the farmer's market. We've done outreaches at the county fair. What people want is a map that illustrates the problem. We have some maps that came in from the basin analysis and – but they need to be tweaked to answer the questions that people have. Some of the maps were showing where is the development that's going to occur. Which basins are going to have the largest change of impervious surface as build out is occurring? Those kinds of things will really help people visualize what the problem is.*

### INTERVIEWS: TECHNICAL & PHYSICAL SOLUTIONS

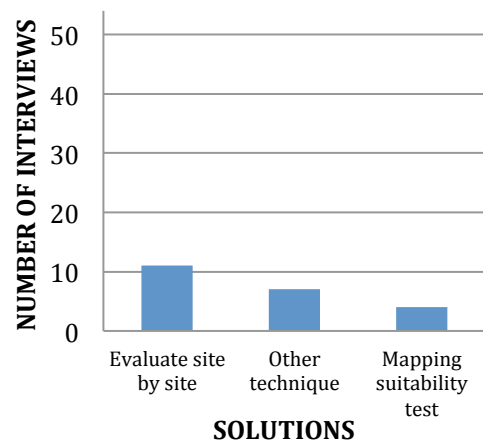


Figure 3.2 Interviews: Technical & Physical Solutions

Solutions to technical and physical barriers proposed in NPDES permit reports and interviews show some commonalities. The importance of site specific analysis, use of other LID techniques other than filtration when necessary, and the creation of soil suitability maps all appear as prominent suggestions.

## Legal and Regulatory

*“Well, I’m thinking if people actually complied with the regulations, we probably wouldn’t have to do a lot more.”*

The NPDES reports offer a potpourri of regulatory solutions. Codes may be rewritten to have LID as the standard, and thereby removed the needs for special permission as a proposed alternative method. Design manuals could be updated, relevant and easy to follow. More than 20% of respondents wanted a clear and consistent definition of LID and “where feasible.” Many reports proposed a discussion with the fire department to see whether an alternative minimum road width or other fire safety regulations could be modified. Equally mentioned were requests for a revision of the Department of Ecology’s LID credit code calculation to give more credits. Specifically to give credit for partial infiltration and for techniques, such as tree preservation, that currently do not receive credits. Several reports proposed mandatory LID as a solution. Several documents specifically expressed a need for localized design standards/manuals. Urban locations felt that the design manuals were made for rural areas with large areas for implementation. Rural areas felt that the design manuals were made for urban lots, and made no mention of how to implement LID on farmland. Both urban and rural areas asked for specific local guidance on class C till soils, and what techniques could be used on areas with poor infiltration. A few reports asked for more regulatory flexibility. Given conflicting regulations, the ability to meet the spirit but not the letter of the law, municipal employees suggest, could be helpful. In contrast, a few reports requested tighter regulation and more enforcement. Instead of treating stormwater as an afterthought, having stormwater at the beginning of the design process is suggested. A few reports suggested a streamlined review process for LID projects. The review process is reported to be long and cumbersome, making it easier to implement traditional infrastructure. A fund to set up for emergencies is suggested for situations like the failure of permeable pavement.

### NPDES REPORTS: LEGAL & REGULATORY SOLUTIONS

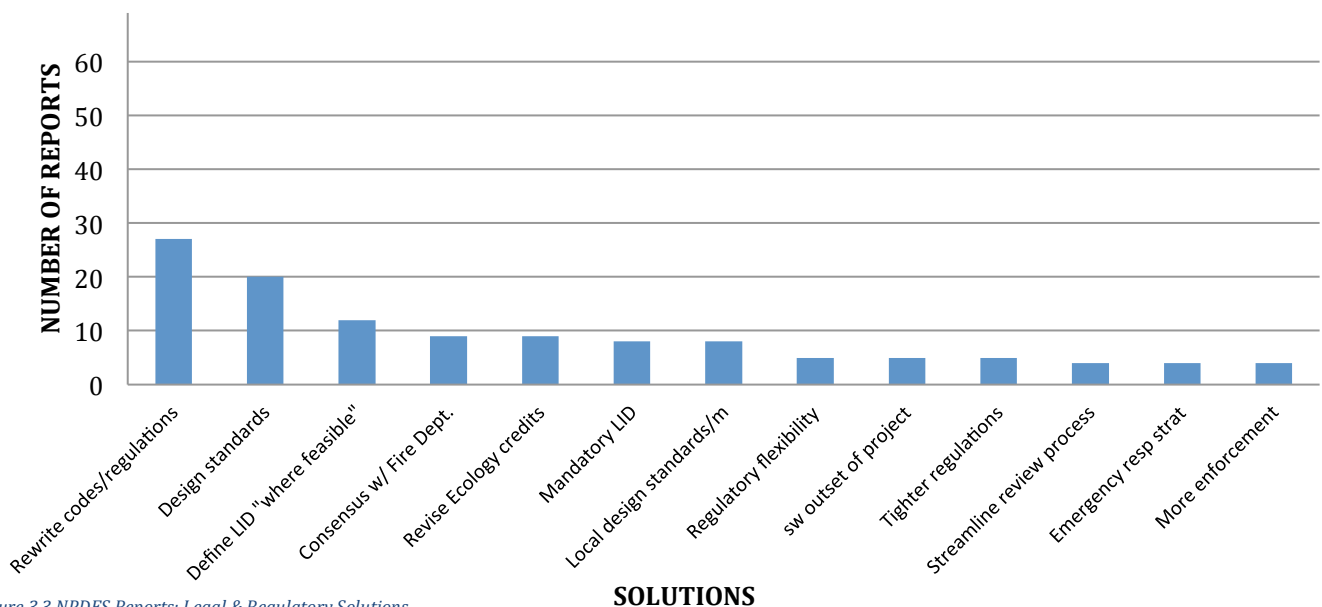


Figure 3.3 NPDES Reports: Legal & Regulatory Solutions

The most frequent regulatory solution to appear in the interviews was also to rewrite codes and regulations. Many municipalities were deeply engaged in this process and recognized it as challenging.

*The process of updating our engineering design and development standards – not just LID but for other things too – we’re still struggling with what exactly we want to allow in the right of way... Unfortunately, sometimes, you implement a standard or a code and it might be a while before it circles through into a project and then maintenance comes back a couple years back and says what the heck. And then they say, well, we did it according to the standard and code and you go, well, but they did this and you go back and read it and it’s like interpretation. Well, that wasn’t what we wanted. So it’s that knowing, that clarity and sometimes you don’t get that feedback right away. So that’s where we try to go out and learn from people who are ahead of us.*

Updated codes might pose difficulty for municipal staff in emergency situations as described below.

*I’d almost say, from my couple current interactions with securing shoreline permits, our new Shoreline Master Program emphasizes protection of shoreline ecological values and preserving them where they’re suitable or available. So it has a relatively good green language or policies and provisions in just about everything they’re asking to preserve and protect that vital habitat, if you will. ... But I guess on the flip side, for if you’re on the side of infrastructure and making sure it’s functioning, if you’ve got a washout, if the river’s kinda shifted and you’ve got to do some emergency repairs and some emergency maintenance, you know, you kinda want to get in there as fast as you can and get it done in that original footprint, and a lot of times, having to go through the shoreline code, it’s like, “Well, no, you can’t do that,” “No, you can’t do that.” And so what are we supposed to do, tell those residents they can’t get to their house for the next five years?*

Commonly suggested solutions include the consideration of stormwater at the outset of a construction project and update or revise design standards and manuals.

*There’s a perception that green infrastructure is more expensive to install than it is to install hard infrastructure. I think it depends on if the developer is thinking about green infrastructure from the beginning or if they’re trying to shape into their current project at the end. So if they’ve started planning from the beginning and thought about green infrastructure and about the elements that they can now save by doing that versus your traditional elements that would be installed, then I think you would see similar costs, but I think because developers, they have an idea of I wanna build a development with certain width streets and sidewalks and I wanna do a big strip take. I don’t wanna think about it much. I just wanna go with flow and go kinda’ thing. Then they try to put in green infrastructure at the end and they say, “Well no, that costs way too much because the permeable pavement is this much more than traditional pavement so I’m not gonna do that.” Or, “Installing these rain guards along here, that’s cost me this much as*

*compared to putting in a contact filter unit. That's gonna be cheaper to do a contact filter unit." So I think it depends on the perspective and how soon they've thought about implementing that.*

The creation of manuals might help address insufficient knowledge of plants among many municipal employees.

*Because these guys just, they don't know it, they don't know what the plan is, they don't even know what they're looking at, you know, let alone how to take care of it. So, I would say, if you're gonna do that—and you know, it depends on the city. We're not a huge city, so like I say, I don't have a horticulturist person on staff that I go to and say, "Hey, what do I do with this?" So it would be nice if they put this stuff in that they provide maybe a manual, if you will, on what the plants are and some general guidance on how to take care of them. That'd be very helpful. The manual could provide a lot of useful information to maintenance workers who are unfamiliar with plant care.*

When asked what internal changes can be made to remove barriers an interviewee recognizes the need and challenge of updating manuals.

*I can't really pinpoint one exact thing. But we're always catching up with the new regulations and how are we going to write our own manual? Are we going to use theirs? Tweaking it a little bit and then educating the development community, the utilities – that's all the challenge. How do you do that? Because it takes resources, costs.*

A stronger mandate for LID often appears as an external change that would help advance green infrastructure. One interview states the case bluntly, "If it's not mandated, we're not going to do it." One suggestion for more enforcement is to set up a certification system for LID similar to way Department of Ecology manages sediment and erosion control with the Certified Erosion and Sediment Control Lead (CESCL).

*Maybe it's almost like how now, the Department of Ecology requires that every construction site have someone called a CESCL onsite. It's a construction sediment and erosion control lead. They have to go through a three-day training on how to prevent sediment from leaving the site. It's a training program by the Department of Ecology required by Ecology for contractors, so it's a direct relationship there. If there could be a similar thing, maybe, for LID. The \_\_\_\_\_ community's not gonna like that idea, but I guess it's one way that you would start to chip away at getting people actually trained because if you don't require it and you're not paying them to do it, they're not gonna do it. On their own time, they just won't.*

One municipal council was reportedly torn between pro-green and anti-green sentiments. Mandatory LID, it was proposed, could assist with taking the finger away from elected officials.

*If the developer feels like ... they are being forced to do something that is not codified, they will generally take it to a council member or the mayor. So the code has to have some teeth in it or*

*... any green infrastructure is essentially going to be a voluntary thing and most developers that I've met – at least out in this neck of the woods – are anti LID, anti-green.*

Another interviewee explains the connection between public process and codes.

*I mean, to the degree that, ultimately, the head of the county is elected officials who are based on the populace and what they want, that paradigm shift or that knowledge base ... occurs on the outside that would be reflected inward. ... If there was a code that said ... 50 percent of your project had to include green infrastructure, they'd find a way to get the 50 percent.*

A similar demand for more feedback and enforcement from the Department of Ecology appears in interviews.

*I mean, we worked really hard. I made sure all my stuff – it's, like, I'm begging, please, give me some feedback. Look at this thing. I've been here 22 years. I have not had one person look at our documents. I did have a really good resource when I first started here from Ecology, and we played good cop/bad cop. So when I first got here, I mean, the housekeeping and our attendance was just horrific, and we still have a ways to go. But if I wouldn't get any direction, I would call him up, he'd be up, and here's the stick. You will listen to me. I'll do what he says, or we'll fine you. Ecology just doesn't have the people, the staff, to get out and do inspections or provide assistance. It's just sad. And I think sometimes Ecology is a little – they're not enforcement enough. You know, they'll come down and they'll fine certain individuals, but those fines get lifted fairly easily. I think their needs to be somewhat a little bit more of a stick.*

Employees from small, rural municipalities report that they find it difficult to conduct enforcement without support from state agencies.

*Lack of staff for implementation and a leaning of the residents' belief that they don't have to obey, they don't have to follow the rules. There's been a fair amount of that within the community. So enforcement is very difficult because – and then the other problem is that we don't have the resources. When we see a violation, when we see a problem and we've reached out to Ecology, their response has been, "Not our problem, it's your problem." So there has been an unwillingness on the part – on the state and state agencies to assist. And being a small community we have neither the resources nor the expertise to handle these things. And without assistance from Ecology we just can't take it on.*

While some municipal employees request stronger enforcement, others want more flexibility, especially when, in their opinion, the proposed project meets the spirit but not the letter of the law.

*But one of the other barriers with this project is definitely regulatory limitations. It's hard to provide an incentive for people to do a project that tears up their landscaping when we can't offer them to make it into some kind of a really cool feature for them as well. And, right now, our current regulations in the watershed don't allow that on a large part of our high-impact*

*audience, which is on the shoreline. They're not allowed to develop in the way that we could pair with a water quality improvement that mitigates 100 percent of the pollution off their property, but they're not allowed to do those types of projects even though if they paired a water quality, a stormwater runoff, pollution-reduction project with it, then they would have zero impact on the lake. Our regulations don't allow for them to develop like a patio or –...We could show them what it could look like and they could say, whoa, if I mitigate with this infiltration trench that goes 15 feet right here on my property, I can build this patio that I've been dreaming of for 10 years, but the city's regulations haven't allowed me to do it.*

One way to provide that flexibility might be to move towards performance standards and away from prescriptive methods, according to an employee of a small, rural, non-permitted municipalities.

*I'm a big believer in performance standards rather than prescriptive methods. And so the important aspect of the dialogue between myself, you know, sort of at the programmatic and management side and the engineers from the technical side is what are the performance criteria? What are my performance criteria that I want this thing to do or this thing – how this thing is to happen. And then they can determine how technically this is achievable and what are the sort of engineering and cost liabilities with it or cost consequences for it.*

Focusing on the performance standards rather than the prescriptive methods is one reported potential solution.

Some municipal employees suggest changes to the permitting process as a solution to legal and regulatory barriers.

*The idea that you have to get a shoreline permit to do restoration on your shoreline is sort of a backwards way of getting to it, because we want to facilitate that stuff. And when we make you pay \$1,000.00 and get an engineering report and do all the permitting process to get a permit to soften your shoreline, to remove your bulkhead for the good of the watershed [laughs] or the good of the waterbody you're associated with, and we say, ah, if you want to remove that bulkhead, you have to go through this big rigmarole for permits to do the right thing, that adds a big barrier there that we need to work hard to overcome. And I don't really know that there's a good way to do it, because there are purposes to careful development of shoreline properties. And, sometimes, there's a need for erosion prevention. And I don't really see a way that we overcome – that we can just give a free pass to people... I think that a workable solution could be a municipal program like I run where I work with homeowners around [a lake] that actually provides the technical assistance for a shoreline protection or shoreline restoration project that includes a free permit. So it's not that you don't have to get the permit and you don't have to show the work. It's just that you don't have to pay an engineer and you don't have to pay the city for that permit.*

Some municipal employees have had success collaborating with other departments responsible for fire, safety, and other conflicting codes.



*So we have a project that has LID or more sustainable elements – yeah, it mostly comes from design and then as we develop our design we want to make sure that it meets the traffic safety requirements. So we include those people. We want to be sure it can be maintained so we include those people and so we as we develop our design we would send out plans or email and say, “Hey, we’re thinking of this. Do you want to sit down and discuss it before we get too deep into this design, do you think it’s something we can do?”*

*We had a lot of conversation with the fire marshal. ... When we got to that point, I said, you know, I'm just gonna defer to what the fire marshal says. And at first he said as long as you sprinkle the buildings I don't care if there's roads there or not. And then when the applicants researched the cost of sprinkling the buildings they went back and said, "Well, what else can we do?" [Laughter] So we actually had the fire marshal go out and look at the site and say, "Well, if you add a pullout here, even if it's gravel instead of pavement, as long as it'll support the weight of the fire truck and we can reach a fire hose to the farthest building, we're okay with it." So they were very willing to, I guess, kind of stretch their regulations to help make the project work."*

It is clear from the interviews, participant observation, and surveys that local municipalities are in the midst of changing and updating their codes and regulations to facilitate the implementation of green infrastructure.

Rewriting codes and regulations, a process currently underway in many municipalities, is recognized as a solution in NPDES reports and interviews. In the process of rewriting code municipalities are struggling to find the right balance between mandates and flexibility to meet a variety of safety and environmental priorities. Adopting and localizing design standards and manuals, collaborating with other agencies, and considering stormwater at the outset of a project are also recognized as valuable efforts to advance green infrastructure.

### INTERVIEWS: LEGAL & REGULATORY SOLUTIONS

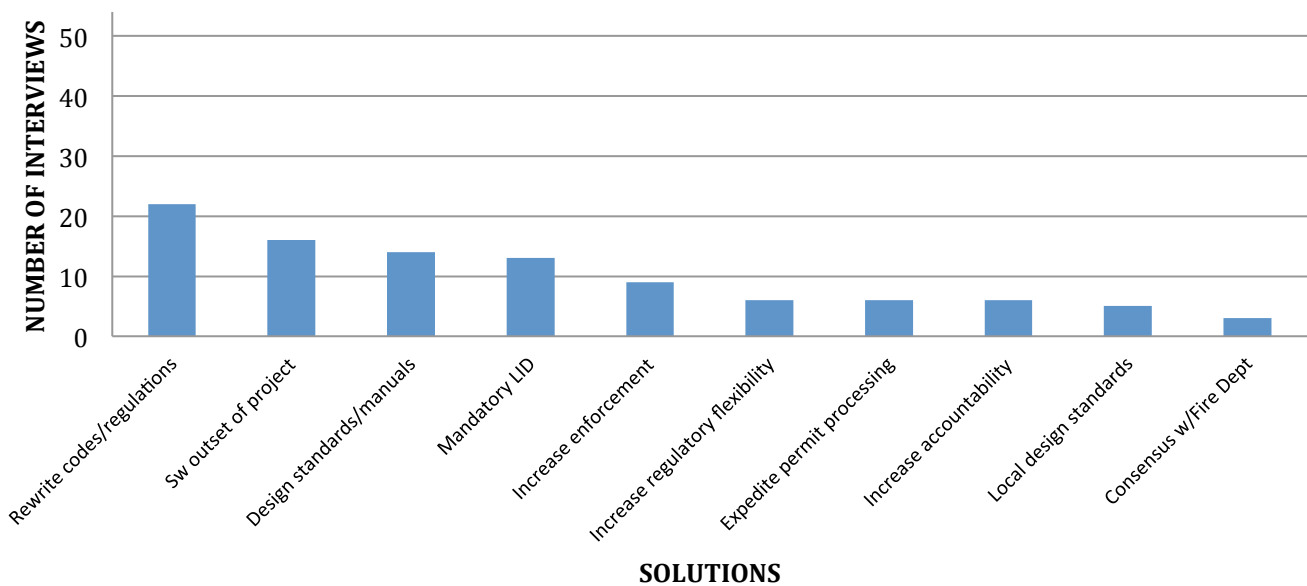


Figure 3.4 Interviews: Legal & Regulatory Solutions

## Financial

*“Rather than approaching it as a regional issue, let’s spend the money at the place that makes the most sense regionally. So, you can scale that all the way up to Puget Sound and say, if we pooled our resources, maybe we could achieve more than working in isolation.*”

The most frequently mentioned financial solution in NPDES permit reports is the desire for a clear cost and performance analysis. Municipal employees want to know how much materials cost and how these LID techniques hold up over time. Other solutions include more financial incentives, such as grants for increasing staff, green infrastructure, and/or consulting engineers. In order for LID facilities to be functionally built and maintained over time, NPDES reports insist that an increase of funding is necessary for the LID construction material, maintenance equipment, and the people who are involved in the building and maintenance. Consulting engineers can be useful for their expertise in this process. A few reports mention that green economics such as triple bottom line and natural capital valuation could be used to help people perceive the economic value of building green infrastructure. A few reports also mentioned that increased taxes and/or impact fees could be used to help fund construction and/or maintenance.

### NPDES REPORTS: FINANCIAL SOLUTIONS

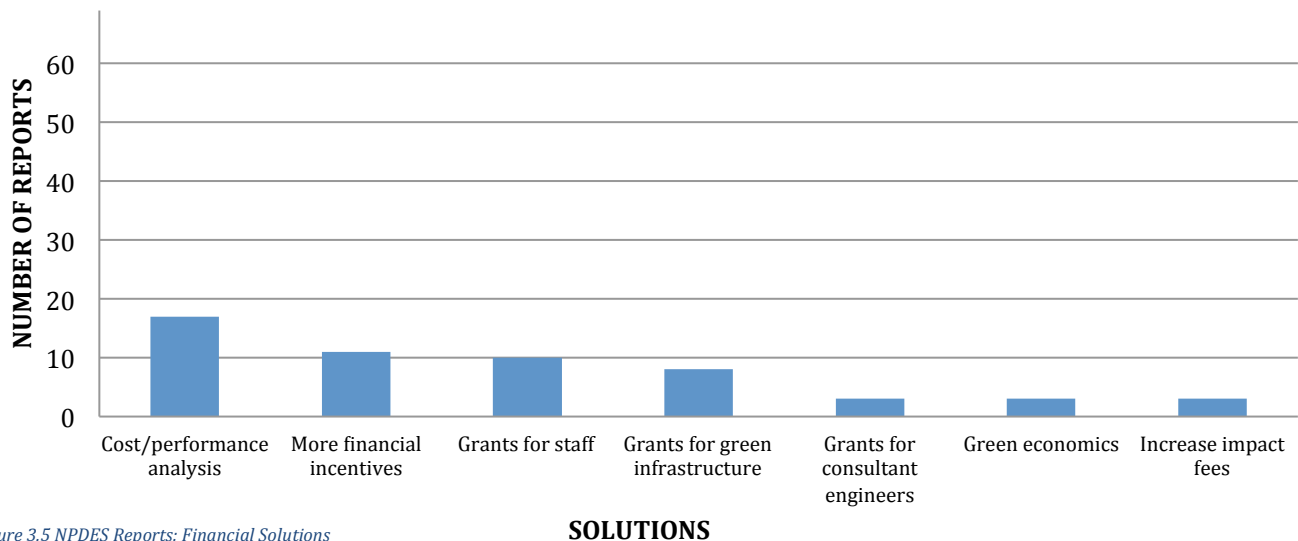


Figure 3.5 NPDES Reports: Financial Solutions

Perhaps because we were perceived as conduits of information to Puget Sound Partnership, grants for green infrastructure and equipment appear as the most persistent financial solution mentioned in the interviews. A typical response to question about external support that might help remove barriers to the use of green infrastructure goes straight to financial issues but within a larger context of change. The underlying issue here may be more a need for alignment than just for funding.

*Obviously money. Support from state agencies to get all on the same page. Support by means of aligning the state goals. Anything that could make it, just like any incentive program, make it*

*easier to do green infrastructure and less or more difficult to do traditional and creating a system that makes it where it's the default really is what needs to happen in order for it to really get common.*

Grants specific for green infrastructure projects receive significant mention.

*I did a rain garden workshop last year that was really - people really liked it. They said, "Do you have any grants to help us install these rain gardens?" I thought it would be really cool to get a grant to do a week of rain gardens and just hire an excavator for a week, and just go around to everyone's properties that want one and do the excavation and just to have a team that goes from one to the other. So if I could find a grant to do that, that would be really cool.*

The reported differential impact of long-term maintenance costs from green infrastructure projects may be driving some requests for grants.

*It's just like anything you build, and there's more and more demand of the transportation system. Everything you build has to be maintained. Preservation dollars are hard to get and hard to come by, as even capital project dollars, and so we always pursue capital and grants in other forms, but there's a lot more limited opportunity used to pursue preservation dollars, and so that hits your local money. So that's always a concern, especially from our maintenance division.*

*Maintenance grants would be cool or putting maintenance dollars with capital would be an incentive if you could be like, "We're going to do this and they're gonna give us money to maintain it."*

Some respondents hope funding from external sources for staff might help overcome lack of leadership in their own municipality or resistance from staff in other departments.

*We don't have a dedicated staff person or expert staff person specifically devoted to green infrastructure... There's a lot of pressure from the big picture to not raise fees or taxes or anything like that as well. So without strong leadership we're not going to get that type of extra support to be able to help fund another position or two or whatever to be able to support that kind of program. Grant funding and the fact that we don't go after grant funding to do that and just there's relatively limited grant funding to do green infrastructure programs.*

*Having the resources, having the incentives, having some sort of ability to draw on why the extra cost for green incentives would be better as a way to encourage public works to embrace that a bit more.*

A persistently proposed financial solution is to provide more data on cost and performance analysis. When asked for a comprehensive approach to Puget Sound recovery an interviewee expressed a desire for more cost and performance measures that is illustrative of broader trends.

*Organizationally I don't know how you can make it any more comprehensive by restructuring different groups or a new position or something, but as a priority or an emphasis, it seems to me that one change that could be made at a minimum would be to put more emphasis into measuring the effect of what's been done and then have a correlation of cost.*

An occasionally mentioned solution is green economics that apply triple bottom line metrics and/or place a value on natural capital. In response to a question about if and how their municipality goes beyond minimum state and federal LID requirements, an interviewee acknowledged informal applications of green economics yet called for a more formal one.

*We do, in the world of urban forestry. We do some outreach in terms of – we're talking about green infrastructure – our urban forestry program includes elements of talking about the value of trees from a air pollution, from a stormwater standpoint. The economic value, that you can try to apply a dollar value to that.*

Increasing impact fees, use of bonds, and local control of funding also came up occasionally as proposed solutions.

*We've just identified the top 5 and the top 25 projects needed in the county, and it's \$6 million and another \$6 million for the top 5 and the other ones. At the current fee structure on the property tax, it's 100 years before we recuperate the \$6 million. So we're looking at new fee structures. I think bonding is going to be the greatest ability, because we need the money upfront to do these, and we need to get them in ground. ... If the same funds that are being used for that, were redistributed and held a little barbeque on each street, with the neighbors saying, "Here's the plan. Here's the plants. This is in your front yard. You own this. We'll pay you \$100 a year to keep these plants together, to keep them growing", you would have much better buy-in. You'd have better education, and you're probably going to have a much more successful outcome with long-term maintenance.*

A couple of respondents requested the Puget Sound Partnership allow Local Integrating Organizations (LIOs) more control over funding. With a new funding model from EPA, the PSP is already implementing this request for more local control over funding. Another request was for more strategic use of money across jurisdictions for larger ecological goals.

*We have done, for stormwater purposes, some rural preservation with city stormwater tax money. But it's pretty rare to move local money across those boundaries. Rather than approaching it as a regional issue, let's spend the money at the place that makes the most sense regionally. So, you can scale that all the way up to Puget Sound and say, if we pooled our resources, maybe we could achieve more than working in isolation.*

Addressing financial issues is a critical component of proposed solutions in NPDES reports and in interviews. Reducing uncertainties in cost and performance is needed. Municipal staff express a

desire for financial incentives or grants for specific projects and more staff focused on green infrastructure, especially the maintenance of it. Assistance with valuation of natural resources in cost/benefit analyses and the regional collaboration for broader goals of Puget Sound recovery could also be helpful.

### INTERVIEWS: FINANCIAL SOLUTIONS

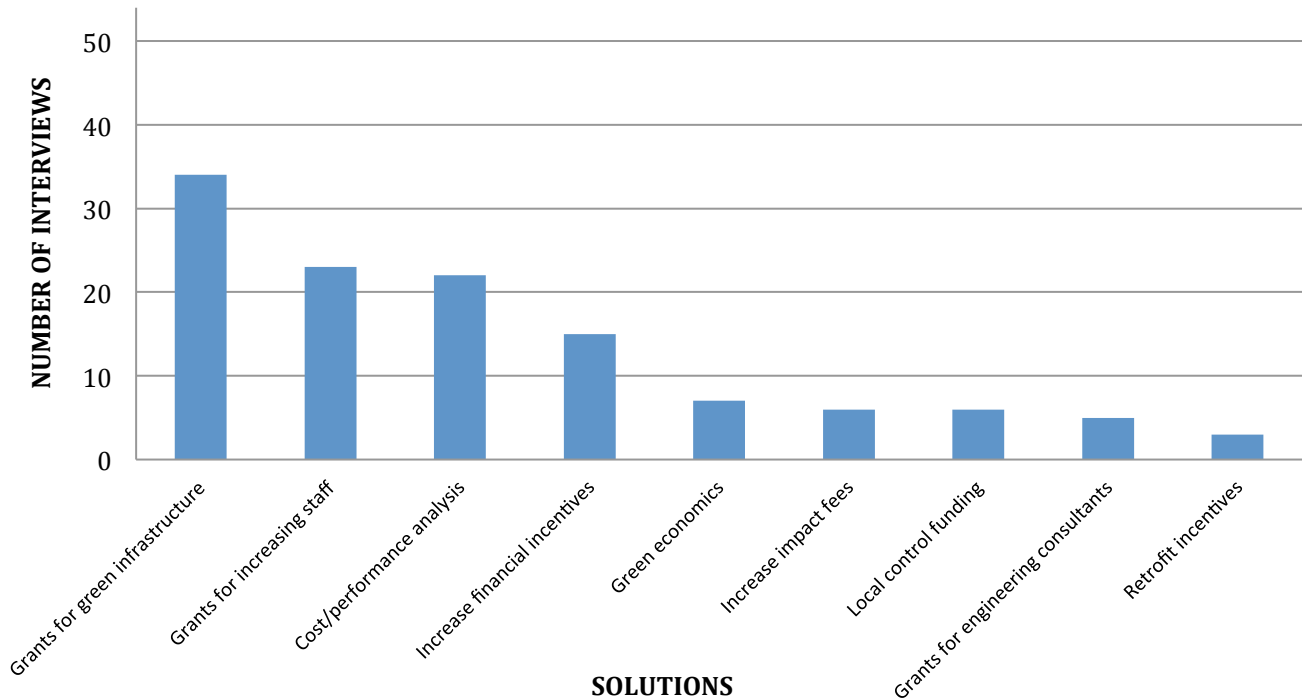


Figure 3.6 Interviews: Financial Solutions

### Community and Institutional

*“If the right pieces are in place where we have leadership that buys into green infrastructure ... the idea that it’s an important thing for us to do. That leader could influence our public works director and influence our [elected officials] in order to move and to do things that were above the minimum requirements.”*

The most frequently reported solution in the NPDES reports was public education. One report suggested “Develop brochures and other resources describing LID and its functions and benefits focused on the general public; keep their LID webpage up to date, install pilot projects at city hall as high profile educational opportunity for residential landowners and elected officials.” More staff training was also a persistent solution. Social marketing and public behavior change came up frequently. Occasional solutions included private property maintenance training, and inter-jurisdictional collaboration. One report claimed, “various stormwater forums can share resources to

address concerns, work together to obtain grant funding for consultant to create standards, specifications and operating procedures.” Online formats are reportedly useful for sharing lessons learned, design manuals and other information among jurisdictions. Upper municipal management were occasionally reported as being responsible for giving direction and assisting to remove barriers such as lack of staff or funding. Better internal communication was occasionally reported as a desirable solution. One jurisdiction suggested that designated staff could attend a training session and then relay the information to remaining staff members. Public behavior change and the need for more inspections were occasionally reported as solutions. A reorganization of responsibilities for maintenance of stormwater facilities was occasionally reported as a solution.

### NPDES REPORTS: COMMUNITY/INSTITUTIONAL SOLUTIONS

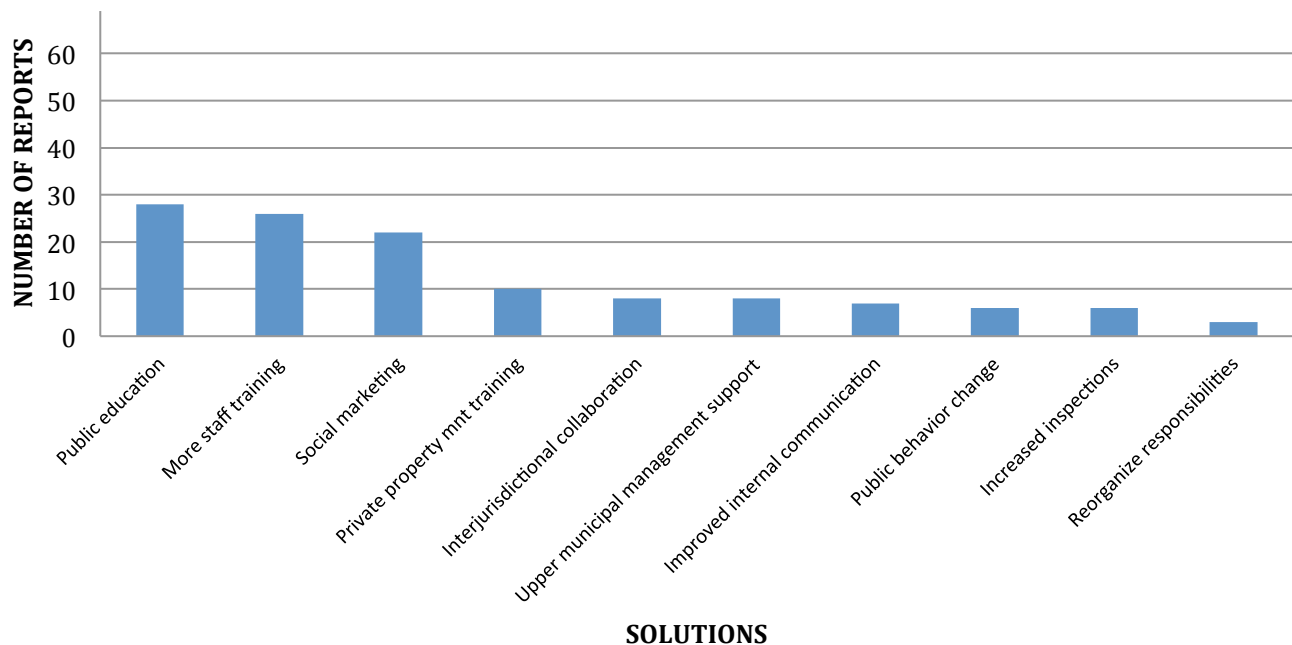


Figure 3.7 NPDES Reports: Community/Institutional Solutions

An interviewee explains the challenge of presenting the need and importance of LID to the public as integral to a comprehensive approach to Puget Sound recovery.

*We say, “LID is the next greatest thing.” And we don’t talk – or we don’t inform the public that there is a cost to it. And cost isn’t the overriding issue, but it is a factor and we need to keep that out there so as long as people go in well informed of what we’re – what this means. I mean, in the implementation of these standards I think is very important so that it’s not sticker shock later or why were you doing this. It’s going in and educating people. I think that’s part of a comprehensive strategy. I think that so we know the benefits, the strengths, the weaknesses, how is it affecting the public, how is it affecting our environment. But that’s all part of the education piece.*

The next most persistent solution offered in interviews is more staff training. The interviewee above goes on to explain the desire for more staff training.

*I think a comprehensive approach would include understanding – and it comes back to some of the construction practices, ... low impact green infrastructure, the training that's necessary there to have the techniques, to understand how some of this is going to be constructed, how it's going to be maintained is very important in a comprehensive approach to this. The education of staff, not only staff internal to the jurisdictions but also the private development community –whether it's their engineers, architects, so that we're not challenging each other all the time that the jurisdiction is at loggerheads with the development community.*

The need for better internal and external communication is frequently addressed but that need is also linked to other concerns of cost and time as illustrated below. A typical respondent notes, “There seems to be a real benefit when you can see that other agencies have done something and see what – how they've done it and how it's working.” Other comments recognize the need but also the implications for the institution more generally.

*I think some of that [communication] would go back to the time and the resources that you have to implement the job. For the [Elected Officials and/or Administrative Staff] to have this vision and to share that with the upper management and how it was all coordinated, and how they saw us achieving some of those—those or anything else, perhaps I could even say—and then the upper management relaying that in a framework that got to the middle management, which was then redirected and got to line staff on how my piece of the puzzle fit within the piece of the puzzle that Parks and Solid Waste were doing such that when I went and got the permit from the person at [Community and Development Planning], he was like, “Oh yeah, you're doing this part of how this whole thing is gonna go together that's gonna make the county do better at habitat management.” It would come down to dedicating time and resources to making that communication happen. It really needs to; time needs to be set aside. And it's not—in fact, we're actually told we need to be charging our time to projects, and you're limited on the amount of admin or operations that you should be charging your time to, and it's looked at and considered. We were given a very small allotment of time to be working on anything but a product with a charge code and a budget and just government operations and keeping everyone informed as a pie in the sky notion, or an unfunded mandate.*

Even though internal communication is recommended, it may be constrained by other aspects of the structure and function of municipal governments.

Municipal management and elected officials also appear as a potential part of the solution to challenges implementing green infrastructure. For example, an informal interviewee noted that replacing current upper management would contribute to green infrastructure implementation. In another jurisdiction, the interviewee finds management helpful while explaining what is working well. “I think specifically between ... operations and engineering from the stormwater perspective, it's the managers all buy in to what needs to happen and everyone works together to accomplish that. They buy into trying to improve water quality and they buy into trying to meet the permit.” In one

jurisdiction, the managers contribute to a positive environment, in the other jurisdiction, removal of a specific manager could be the potential solution.

Social marketing campaigns and public behavior change both receive significant mention in the interviews. In regards to a comprehensive approach to cleaning up Puget Sound, an interviewee mentions behavior change efforts, "Cleaning up car exhaust and big shipping freighters and stuff like that. Run offs, making sure that people are aware and try not to throw stuff down the drains." A recognition that incentives are an important part of human behavior change is also noted.

*I also think that there needs to be some type of incentive. It should be incentivized. You really can't change behavior without some type of an incentive. So first, I would, again, cooperative and then some type of education so people know what and why, and then their needs to be some type of an incentive to help it.*

One interviewee finds hope and need in these social marketing efforts.

*We used to see people pitch garbage out the window of a car on the freeway. Then we had our first marketing campaign with a Native American with a tear, and picking up liter, and now we're two generations out where we recycle everything, especially in more urbanized areas, we recycle everything. It's a pretty dramatic shift. So there's hope. Our behaviors are changing. Our approach is changing, but it's still a long ways out from being real sustainable.*

More inspections may be part of institutional and community changes. One interviewee illustrates the challenge posed by staff reductions and the resulting lack of inspections.

*We were somewhere yesterday and somebody that used to work in [Community and Development Planning] and did that work was commenting, "Oh yeah, look at that development on top of the wetland." They don't have anybody that goes out and when they do the permit review that biologists anymore – I think they might have one – but they don't really go out on the ground and look at what these developers are doing, right? So it's self-certifying basically. The developers write everything up and then they look at it here and then they okay it or ask some questions, but they don't go out there anymore. All that was cut, all those people were cut.*

Municipal employees report that they would like having more staff on the ground and doing inspections to prevent situations where development is occurring on wetlands. Other issues mentioned on occasion include maintenance training for private property owners and reorganization of responsibilities for maintenance of private facilities.

*I think we could do a better job of helping to maintain private facilities because unfortunately private facilities are not being maintained by the private owners and if we have the knowledge and ability to maintain them, ultimately it is our permit that we're – that we need to comply with.*



Rather than having private property owners maintain their own stormwater facilities, municipal employees, it is proposed here, could take on this responsibility a solution that is already implemented in some municipalities.

The solutions offered for community and institutional barriers emphasize the need for education, communication, training, social marketing, and public behavior change. Internally, better communication and support from upper management is desirable while reorganization receives minimal mention.

### INTERVIEWS: COMMUNITY & INSTITUTIONAL SOLUTIONS

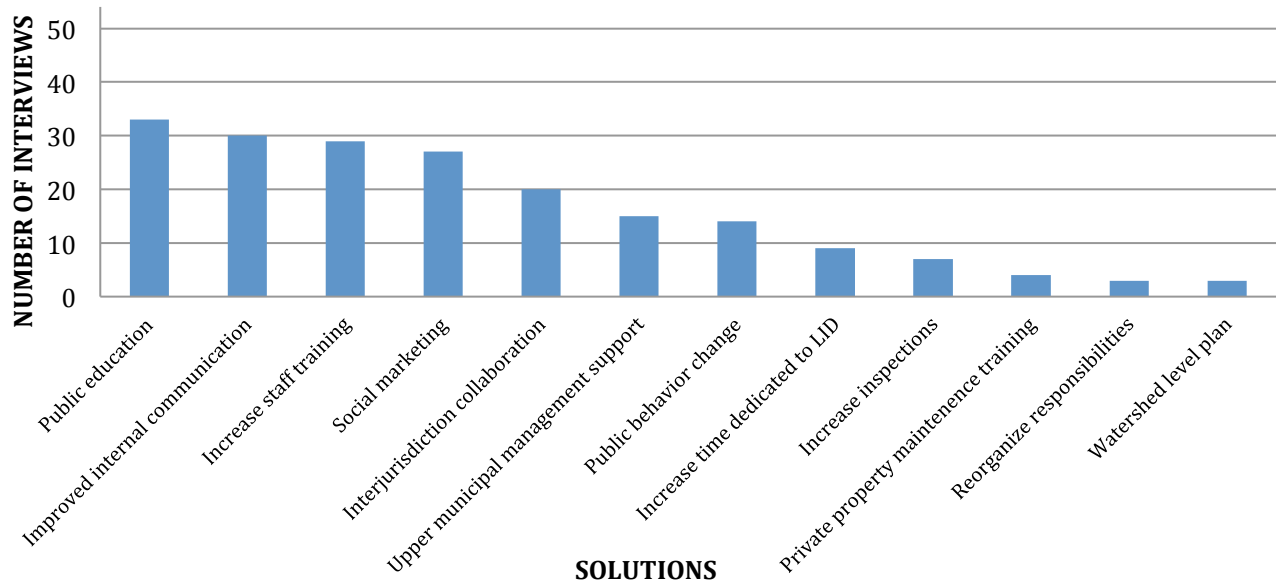


Figure 3.8 Interviews: Community & Institutional Solutions

#### Solutions in Survey Responses

Survey questions 9 and 10 requested municipal employee perspectives on potential solutions to green infrastructure challenges. Question 9 asked respondents to rate the relative value of internal changes that might help remove barriers, while question 10 asked for ratings of forms of external support that may help remove barriers. As in the previous questions about barriers the survey offered four-point Likert scales that ranged from not a solution (1) to somewhat helpful (2), generally helpful (3), and very helpful (4). Respondents could also select unknown. The significant differences are discussed in narrative form below and interested readers are invited to review the ANOVA data more closely in Appendix J and the descriptive statistics for internal solutions in Appendix L and external solutions in Appendix M. Interpreting each data set will be facilitated by using the list of item/variable codes from Appendix G.

#### Research Question 7: What internal changes might remove those barriers?

**Q9. Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction.**

- 1 – Not a solution
- 2 – Somewhat helpful
- 3 – Generally helpful
- 4 – Very helpful

*Table 2.2 Descriptive Statistics: Internal changes that might remove barriers: Item Q9*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	137	1	4	3.42	.715
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	137	1	4	3.32	.923
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	135	1	4	3.30	.775
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	145	1	4	3.17	.877
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF	140	1	4	3.12	.869
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	141	1	4	3.04	.909
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	137	1	4	3.03	.866
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	141	1	4	3.02	.815
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	133	1	4	2.97	.921
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	112	1	4	2.93	1.011
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	114	1	4	2.92	.894
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	137	1	4	2.91	1.035
Q9.21 DEMONSTRATION PROJECTS	142	1	4	2.89	.831
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE	123	1	4	2.88	.972
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	123	1	4	2.81	1.011
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	122	1	4	2.79	.973
Q9.10 EXPEDITED PERMITS AS INCENTIVE	133	1	4	2.71	1.063
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	133	1	4	2.66	.992
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	114	1	4	2.48	1.075
Q9.07 INCREASING IMPACT FEES	120	1	4	2.48	1.045
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	122	1	4	2.05	1.082

### SURVEY: TOP FIVE INTERNAL SOLUTIONS

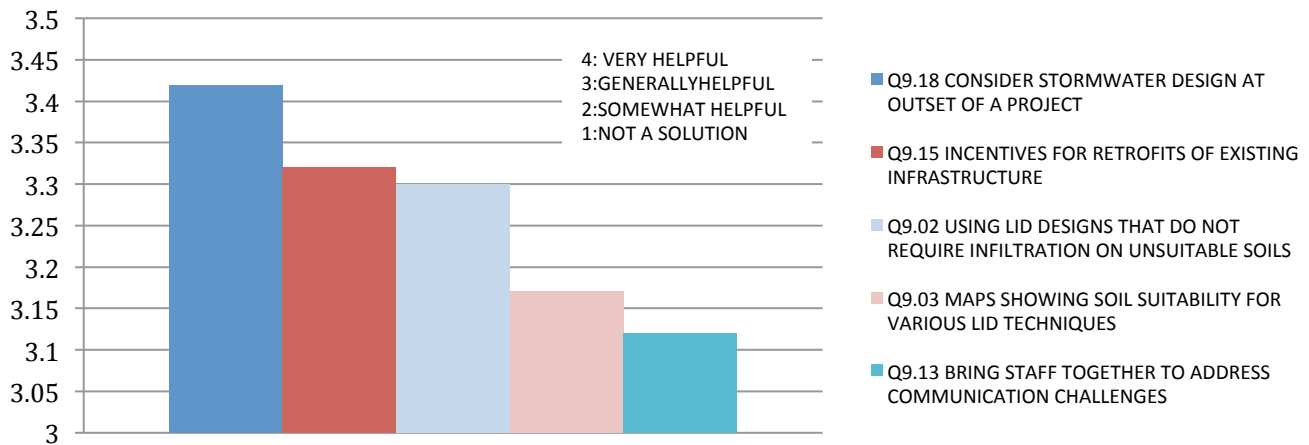


Figure 3.9 Survey: Top five internal solutions to barriers: Item Q9

The top five internal solutions, ranked by mean, include “Consider stormwater design at the outset of a project” (Q9.18), “Incentives for retrofits of existing infrastructure” (Q9.15), “Using LID designs that do not require infiltration on unsuitable soils” (Q9.02), “Maps showing soil suitability for various LID techniques” (Q9.03), and “Bring engineers, permitting, planning, natural resource, and maintenance staff together to address communication challenges” (Q9.13). Each of these items had a mean above 3.0 indicating that the average respondent rated them between generally and very helpful. The only listed item ranked near somewhat helpful was “Reorganization of structural divisions and functions within your municipality” (Q9.12). Two other items ranked closer to somewhat helpful than generally helpful, “Increasing impact fees” (Q9.07), and “Charge stormwater fees based upon amount of discharge” (Q9.20). Considering stormwater early in the design process, incentives for retrofits, adapting LID designs to a site’s soil, mapping soil suitability and facilitating cross-departmental communication appear as the most valuable internal solutions.

**SURVEY: ANOVA  
VARIATIONS : CITY/  
COUNTY: SOLUTIONS  
(Q1:Q9)**

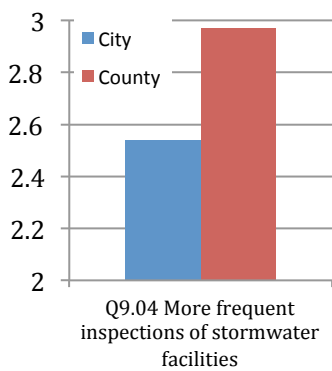


Figure 3.10 Survey: ANOVA Statistically Significant Variations: city vs. county solutions (Q1:Q9)

**SURVEY: ANOVA  
VARIATIONS:  
JURISDICTIONAL SIZE:  
SOLUTIONS (Q3:Q9)**

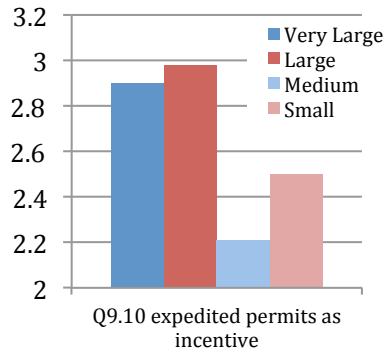


Figure 3.11 Survey: ANOVA Statistically Significant Variations: jurisdictional size solutions (Q3:Q9)

**SURVEY: ANOVA  
VARIATIONS : STAFF  
HIERARCHY : SOLUTIONS  
(Q11:Q9)**

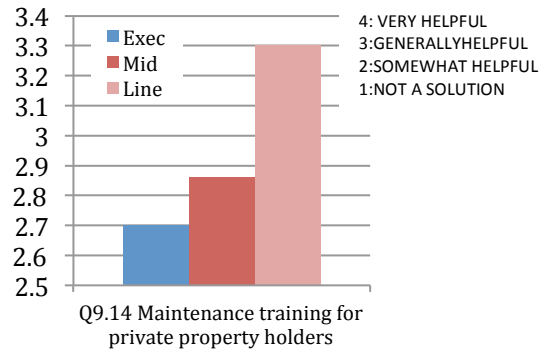


Figure 3.12 Survey: ANOVA Statistically Significant Variations: staff hierarchy solutions (Q11:Q9)

The rankings of potential internal changes varied by the demographic data we collected in a few cases. County staff, for example, found more frequent inspections of stormwater facilities to be a more helpful solution than did city staff. No significant difference appeared between preferences for internal solutions in urban and rural jurisdictions. Very large and large jurisdictions found expedited permits to be more helpful than medium or small ones. Phase I and Phase II permittees found local education and behavior change efforts more helpful than did non-permitted municipalities. Municipalities in Ecology’s Northwest region found more strategic mitigation and stronger support for green infrastructure from upper management more helpful than did those from the Southwest. Line staff found maintenance training for private property holders to be more helpful than did executive or middle management. Other differences between ratings of the helpfulness of solutions by municipal types were not found to be significant.

When internal solutions are considered across different departments within municipalities a few differences stick out. Staff in natural resources and executive offices are more likely to see using LID designs that do not require infiltration as helpful than are other employees from other departments. Incentives for retrofits of existing infrastructure are most appealing to staff in education and outreach and natural resources. While all departments valued bringing staff together to address communication challenges, staff in parks, roads, and natural resources viewed this interdepartmental communication as the most helpful. Local education and behavior change efforts were most appealing to staff in education and outreach and natural resources. Overall, there is remarkable consistency in the recognition of needed internal changes across municipal divisions.

**SURVEY: ANOVA VARIATIONS : NPDES STATUS: SOLUTIONS (Q4:Q9)**

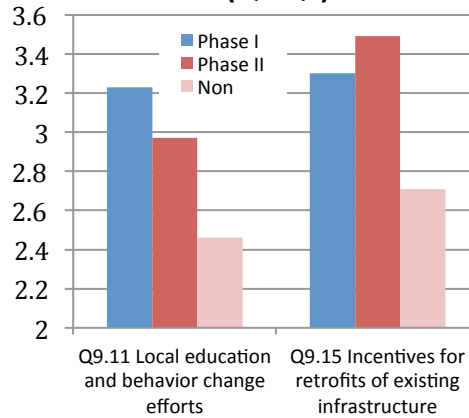


Figure 3.14 Survey: ANOVA Statistically Significant Variations: NPDES status solutions (Q4:Q9)

**SURVEY: ANOVA VARIATIONS : REGIONAL : SOLUTIONS (Q5:Q9)**

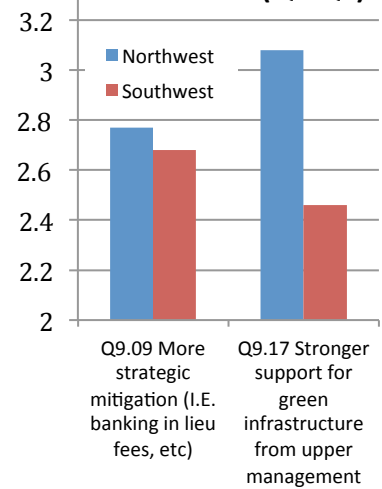


Figure 3.13 Survey: ANOVA Statistically Significant Variations: regional solutions (Q5:Q9)

**SURVEY: DESCRIPTIVE TOP INTERNAL SOLUTIONS (Q9) BY MUNICIPAL DEPARTMENT**

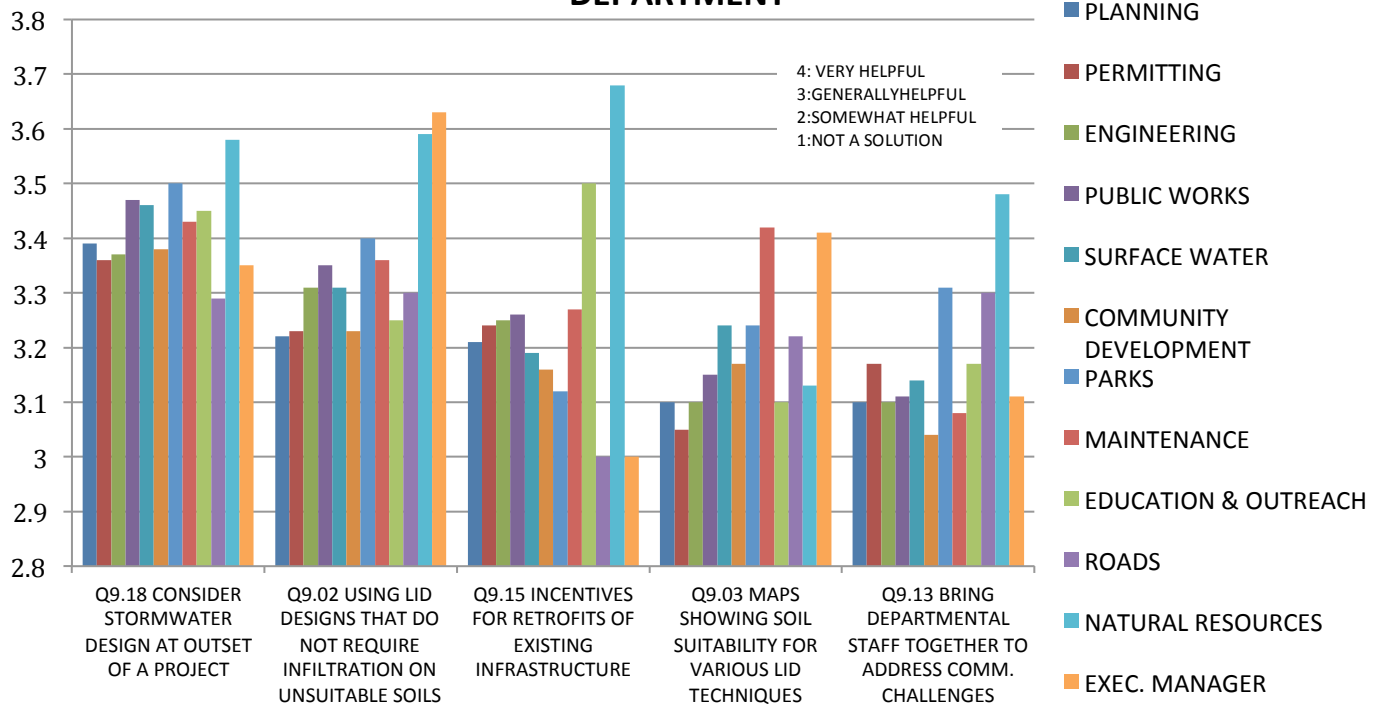
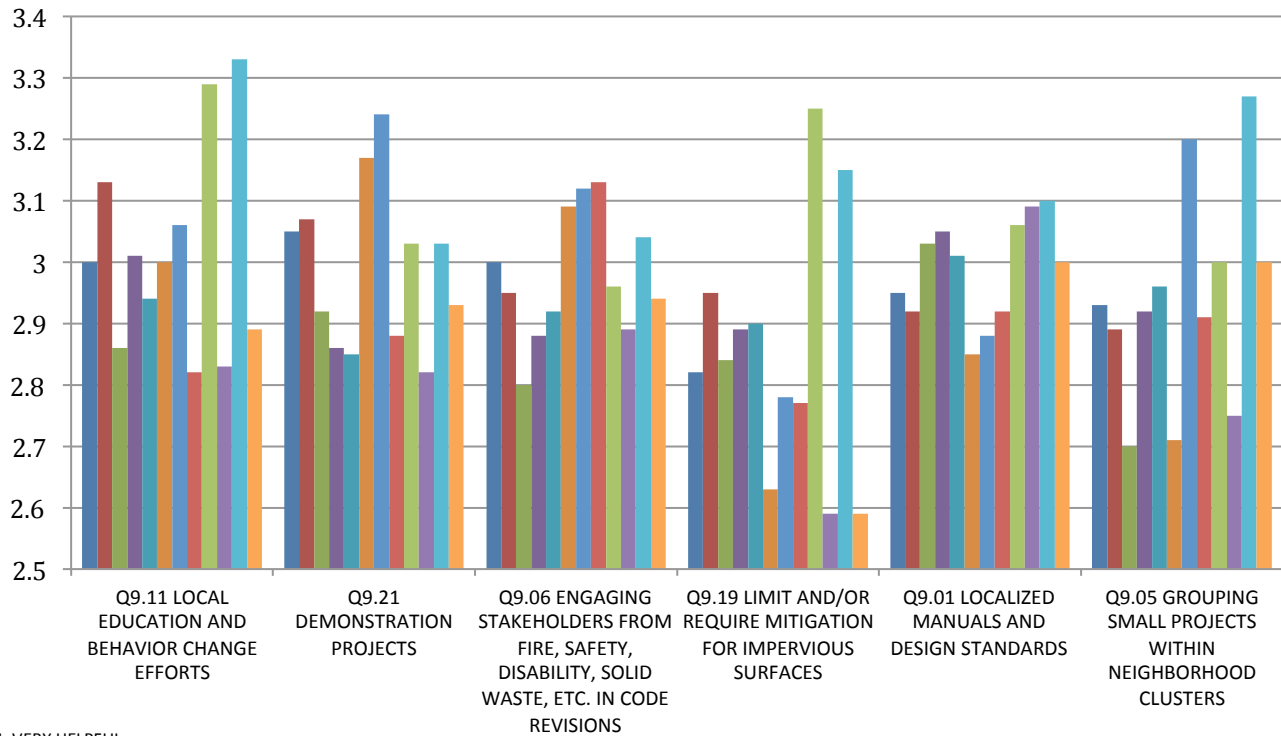


Figure 3.15 Survey: Descriptive Statistics for top solutions by municipal department (Q9:Q12)

## SURVEY: DESCRIPTIVE TOP INTERNAL SOLUTIONS (Q9) BY MUNICIPAL DEPARTMENT



4: VERY HELPFUL  
 3: GENERALLY HELPFUL  
 2: SOMEWHAT HELPFUL  
 1: NOT A SOLUTION

### INTERNAL SOLUTIONS

### Research Question 8: What kinds of external support could remove those barriers?

**Q10. Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction.**

- 1 – Not a solution**
- 2 – Somewhat helpful**
- 3 – Generally helpful**
- 4 – Very helpful**

*Table 2.3 Descriptive Statistics: External support that might remove barriers: Item Q10*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	142	1	4	3.52	.731
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	132	1	4	3.36	.794
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	136	1	4	3.34	.712
Q10.06 GRANTS FOR INCREASING STAFF	137	1	4	3.14	.949
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT	131	1	4	3.10	.885

Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	137	1	4	3.07	.863
Q10.15 SUPPORT FOR WATERSHED PLANNING	132	1	4	3.06	.923
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	141	1	4	3.06	.868
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	136	1	4	3.04	.877
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	136	1	4	3.04	.988
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	102	1	4	3.03	.873
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	128	1	4	2.99	.968
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	142	1	4	2.99	.875
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	132	1	4	2.96	.952
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	139	1	4	2.94	.907
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	133	1	4	2.86	.919
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE	129	1	4	2.73	.998
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	132	1	4	2.73	.958
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	129	1	4	2.69	.917
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	119	1	4	2.69	1.126
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	132	1	4	2.67	1.030
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	109	1	4	2.65	1.109
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	131	1	4	2.56	1.165
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	135	1	4	2.54	1.077
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	134	1	4	2.51	1.136
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	89	1	4	2.29	1.170

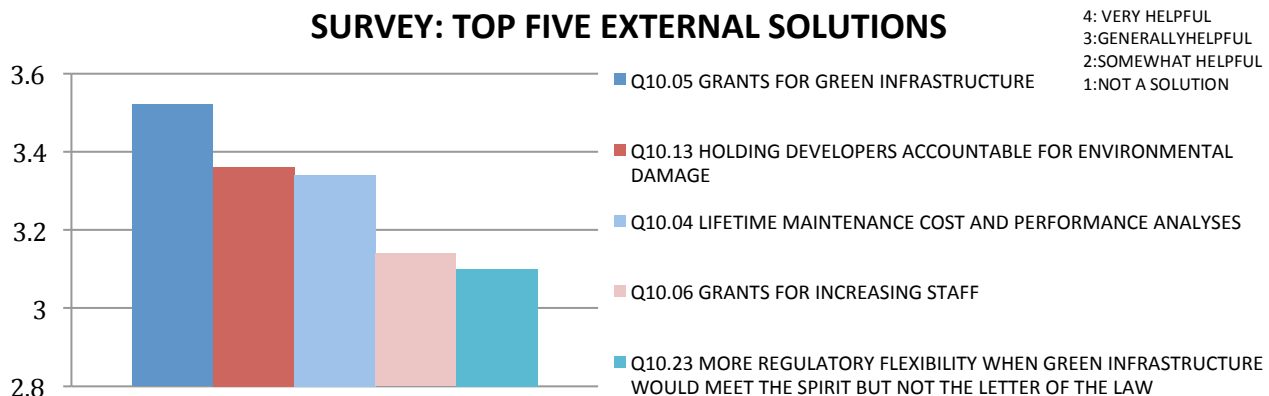


Figure 3.16 Survey: top five external solutions to barriers

The top six forms of external support for removing barriers include “Grants for green infrastructure” (Q10.05), “Holding developers accountable for environmental damage” (Q10.13), “Lifetime maintenance cost and performance analyses” (Q10.04 ), “Grants for increasing staff” (Q10.06), “More regulatory flexibility when green infrastructure would meet the spirit but not the letter of the law” (Q10.23), and “Region-wide education and behavior change efforts” (Q10.25 ). Each of these potential solutions ranked from generally to very helpful. The only item to rate below generally helpful was “Allow Local Integrating Organizations (LIOs) more control of funding resources”

(Q10.20). Grants, cost and performance analyses, accountability, regulatory flexibility, and region-wide education and behavior change efforts appear to be the most helpful forms of external support.

**SURVEY: ANOVA VARIATIONS : JURISDICTION SIZE: SOLUTIONS (Q3:Q10)**

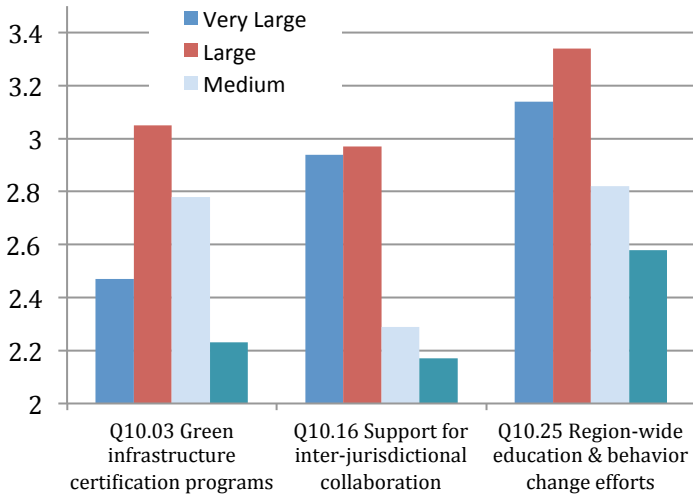


Figure 3.18 Survey: ANOVA Statistically Significant Variations: jurisdiction size external solutions (Q3:Q10)

**SURVEY: ANOVA VARIATIONS : CITY/ COUNTY: SOLUTIONS (Q1:Q10)**

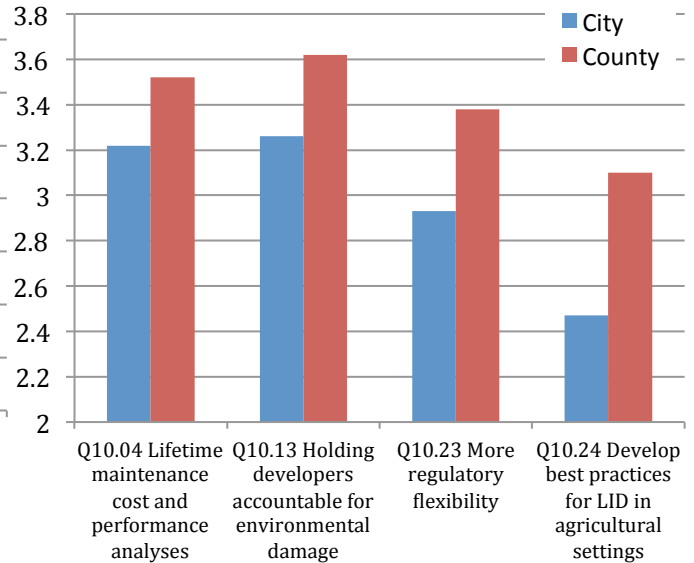


Figure 3.17 Survey: ANOVA Statistically Significant Variations: city vs. county external solutions (Q1:Q10)

A few of the proposed internal solutions varied significantly by municipal characteristics. County staff found more value in lifetime maintenance cost and performance analyses, holding developers accountable for environmental damage, more regulatory flexibility when the spirit of the law is being met, and the development of best practices for LID in agricultural settings. Staff from municipalities with rural constituencies found development of best practices for LID in agricultural settings significantly more helpful than those from exclusively urban areas. Large jurisdictions found green certification programs, inter-jurisdictional collaboration, and region-wide education and behavior change efforts more helpful than other sized municipalities. Staff from Ecology’s Southwest region found more value in green infrastructure certification programs, clearer definitions of LID and “where feasible” and more regulatory flexibility than those from the Northwest. Overall, though, preference for the helpfulness of external solutions showed considerable consistency across and within municipalities.

**SURVEY: ANOVA VARIATIONS : URBAN/ RURAL: SOLUTIONS (Q2:Q10)**

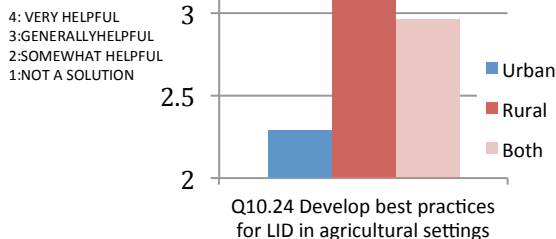


Figure 3.19 Survey: ANOVA Statistically Significant Variations: urban vs. rural external solutions (Q2:Q10)

**SURVEY: ANOVA VARIATIONS : REGIONAL : SOLUTIONS (Q5:Q10)**

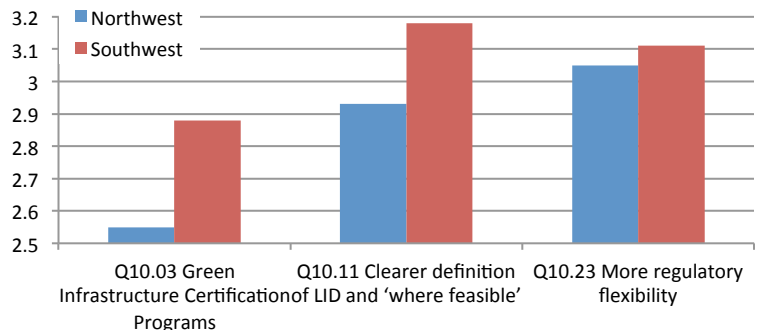


Figure 3.20 Survey: ANOVA Statistically Significant Variations: regional external solutions (Q5:10)

## Structure, Function, and Communication in Municipal Governments

Conceptual maps, interviews, and survey questions provide data to answer questions about structure, function, and effectiveness of communication in municipal governments.

5. How and where are stormwater management, endangered species, habitat, water quality, shoreline master program, and low impact development activities housed in municipal organizations? How effective are those divisions?
6. Where in municipal operations do potential projects encounter barriers?

Survey data already revealed that municipal staff viewed governmental reorganization as the least helpful internal change but broadly welcomed efforts to improve communication. A careful look at structure, function, and communication in municipal governments reveals potential areas to focus efforts at improving dialogue.

The cognitive concept mapping exercise we led with municipal employees took place in 37 of the 54 in depth interviews. All of these interviews were audio recorded and included in the interview transcription analyses. The mapping exercise gave insight into municipality functions that relate to LID and the shoreline master program. It provided a visual representation of where within municipalities barriers are concentrated in relation to division(s), and elucidated the nuances of municipal networking communication and collaboration that can, have, and continue to impact the integration of green infrastructure policy.

## Green Infrastructure Functions

*“Structural issues in the organization mean that green measure are not anyone’s specific responsibility, nor are they incentivized.”*

Table 3.1 shows the division and/or subdivision on the cognitive concept map to which interviewees attributed the following green infrastructure and shoreline master program related functions: stormwater management (SW), endangered species (ES), habitat (HA), water quality (WQ), low impact development (LID), and Shoreline Master Program (SMP). At times, interviewees placed functions under multiple divisions, and signified using a star the primary location of the function. Some departments that were listed on the map were not attributed to any of the six listed functions, hence no numbers are listed in adjacent cells. Interviewees were not asked or probed to include external groups and individuals that exist outside of their own municipal government.

**Table 3.1 Cognitive Concept Maps: Municipality divisions & associated functions**

	Division	SW	ES	HA	WQ	LID	SMP
ADMINISTRATIVE	General					1	
	Judicial Court						
	Elected Leaders/Council/Mayor	2	3	4	4	4	3
	Administration			1			
	City Attorney						



	Executives (City Manager)						
	Finance	1					
	<b>TOTAL</b>	<b>3</b>	<b>3</b>	<b>5</b>	<b>4</b>	<b>5</b>	<b>3</b>
PUBLIC WORKS	General	12***	5*	6**	13	10	5
	Director	3*	2	1	2	2	
	Water Resources/Storm & Surface water Utility	7***	3*	3	8	4**	2
	Planning and Engineering	1	2*	2	1	2	1
	Transportation/Environmental Services	3	3*	4*	3	4	1
	Operations and Maintenance	4		1	3	4	
	Source Control	1	1		1		
	Conservation Corp						
	Urban Stream Monitoring	1	1		1		1
	Education/Outreach	1	1	1	1	1	
	Private Facility Inspection	1	1		1		
	Development Review/Permitting	2			2	1	
	Aquatic Species Inspection	1	1	1	1		
	Stormwater Management	7***	2*	6*	6*	5*	1
	Construction	1	1		1		
	Sewer	2			2		
	Urban Services Standards & Guidelines Manual						
	City Light						
	Field Supervisor						
	Transportation/Street/Roads	3	3	4*	5	5	2
	Garbage						
	PW Engineering	9*	5	5	7**	9*	3
	Capital		1				1
	Right of Way, Traffic						
	Engineering Stormwater Manager	2	1	2	2	2	1
	Inspection Staff					1	
	Operations and Maintenance/ Field Staff	5	4*	4	5	2	
<b>TOTAL</b>	<b>29****</b>	<b>32*****</b>	<b>34***</b>	<b>65***</b>	<b>52****</b>	<b>18</b>	
PARKS	General	4	3	7	4	4	5
	Trails and Trees						
	Planning and Design			1		1	1
	Maintenance						
<b>TOTAL</b>	<b>4</b>	<b>3</b>	<b>8</b>	<b>4</b>	<b>5</b>	<b>6</b>	
CDP	General	7	13*	15*	6	11***	18*****
	Director						
	Natural Resources		1	1	1		

COMMUNITY AND DEVELOPMENT PLANNING	Plan Review	1		1		1	
	Planning and design (long and short range)	4	11*	11*	6	9	12
	Building	1	2	1	2	2	3
	Inspection					1	
	Planner		2*	2*		2	2
	Urban Forester					1	
	Permitting	2	2	2		3	2
	Permitting and Front Counter	1				1	
	Code Enforcement		1				1
	Development Engineering	1			1	1	1
	SEPA						
	Engineering		1	1		1	1
	SMP						
	Critical Areas Ordinance						
	Zoning						
	Economic Development						
	Community Dev./Edu/Tech Support	1*				1*	
	<b>TOTAL</b>	<b>18*</b>	<b>33***</b>	<b>34***</b>	<b>16</b>	<b>34****</b>	<b>40*****</b>
OTHER (OUTSIDE OF PW/CDP)	Operations and Maintenance	1			1		1
	Police			1			
	Airport	1			1	1	1
	Planning Commission						1
	Wastewater Treatment Plant	1			2	1	
	Forestry		1	1		1	
	Natural Resources	1	1	1	1		
	State and Federal Mandates and Permits	1	1	1	1	1	1
	Infrastructure	1	1	1			
	Office of Sustainability	1	1	1	1		
	<b>TOTAL</b>	<b>7</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>4</b>	<b>4</b>
EXTERNAL GROUPS	General						
	Special Interests						
	Conservation District	1	1	1	1	1	
	Environmental Groups						
	Property Rights Groups						
	NGO's		1	1	1		
	Tribes						
	Dept. of Fish and Wildlife						
Citizens/Public Perception			1	1	1		

Dept. of Ecology						
Politics						
<b>TOTAL</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	

Table 3.1 demonstrates that within the context of green infrastructure, there are a variety of divisions, sub-divisions, and departments that interviewees represented within their municipality. Some interviewees chose to include external groups in order to demonstrate the relationship between the municipal staff and outside variables. Some of these external groups include Non Governmental Organizations and the Department of Ecology.

Interviewees placed functions under multiple divisions and sub-divisions. The division that was the primary location for a particular function was given a star. For example, three interviewees felt that the *primary* location for stormwater management was under the sub-division, ‘stormwater management’ within public works. Not all interviewees distinguished primary locations from other locations. We clumped all sub-divisions under primary divisions, although in some municipalities these sub-divisions may fall somewhat outside of a primary division. There is some variability as to exact location and under whose direction sub-divisions like natural resources, surface water management and others exist. Puget Sound municipalities have organized and named their planning division in a multitude of variations including, Planning and Development Services (PDS), Community and Economic Development (CED), Planning Economic Development (PED), and Community and Development Planning (CDP), among others. For the purposes of creating streamlined language for discussing primary divisions, we refer to all planning departments as community and development planning (CDP).

**COGNITIVE CONCEPT MAPS: MUNICIPALITY DIVISIONS AND ASSOCIATED FUNCTIONS**

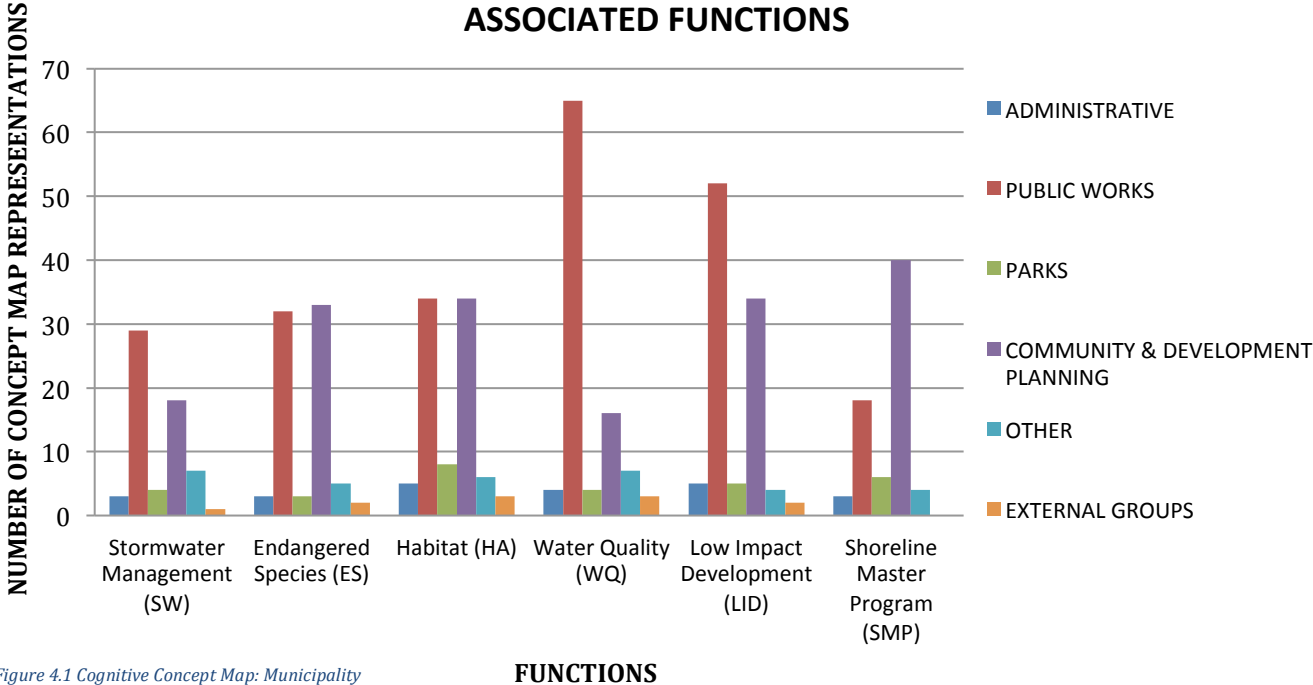


Figure 4.1 Cognitive Concept Map: Municipality divisions and associated functions

The majority of the green infrastructure functions identified in our research questions were attributed to either public works or community and development planning. Parks, other, and external groups constitute additional categories cited in the interviews. The location of specific functions related to green infrastructure within the municipality is demonstrated in Table 3.1. Water quality functions are heavily concentrated in public works, while shoreline master programs are concentrated in community and development planning. Stormwater and LID are more dispersed but remain more heavily in the domain of public works. Endangered species and habitat functions are more equitably distributed between public works and community and development planning.

The surveys provide another means to describe the structure and function of municipalities as relevant to green infrastructure. Questions 12 asked respondents to identify their location within municipal structure and Question 13 asked respondents to identify their involvement with the same six functions discussed above. After verifying the reliability of the data using Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett’s Test of Sphericity we applied a factor analysis to identify principal components of the structure and functions of municipal governments as understood by our respondents. Three principal structural groups emerge from fourteen initial departments or divisions in this analysis of municipal structure. We find engineering, public works, and surface water management in close association for one principal component. In another we find planning, permitting, education and outreach, and natural resources. In the third grouping we find community development, parks, maintenance, airport, roads, municipal manager/executive, and elected officials. Six functions of municipal governments can also be evaluated using factor analysis. The principal components in this case group stormwater management (SW), water quality (WQ), and low impact development (LID) together in one principal factor and endangered species (ES), habitat (HA), and Shoreline Master Program (SMP) in another (see Appendix O). The principal component analysis is thus generally consistent with the concept mapping which illustrated that responsibility for water quality, stormwater, and LID is concentrated in public works and shoreline master programs are typically in planning while responsibility for endangered species and habitat is more equitably dispersed between public works and community and development planning.

### Barrier Concentration

As part of the mapping exercise we asked interviewees, “are the challenges to implementing LID and SMP concentrated in any particular division(s) in your municipality? If so, please indicate on the map where barriers are concentrated.” We had a number of varying responses and manifestations of those interpretations on the maps. A few interviewees expressed some reluctance to identify locations where barriers might be concentrated. The 37 interviewees that participated in the cognitive

### CONCEPT MAP INTERVIEWEE DEPARTMENT

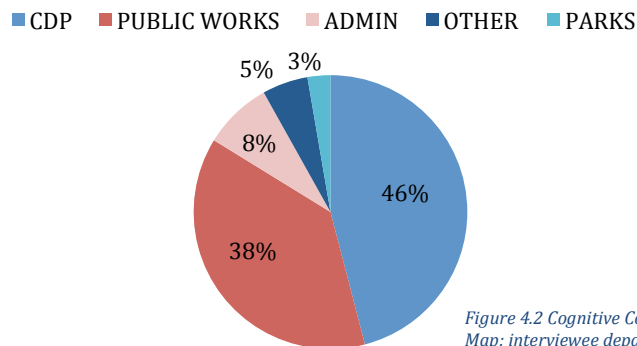


Figure 4.2 Cognitive Concept Map: interviewee department affiliation

concept mapping exercise, a sub-set of the 54 in-depth interviews, identified a total of 15 locations where barriers are concentrated. Within this group of 37 cognitive map interviewees, a small number chose to identify more than one location where barriers are concentrated, totaling 50 visualizations and verbal descriptions of barrier concentrations. The results are in Table 3.2.

*Table 3.2 Location of concentrated barriers identified on cognitive concept map*

<b>Location of Concentrated Barriers</b>	<b>Number of Visualizations</b>
<b>Mayor/city council/"Politics" (elected)</b>	10
<b>City manager/Administration (non-elected)</b>	9
<b>Community and Development Planning CDP (including Permitting)</b>	9
<b>Public Works PW (design, engineering, transportation)</b>	7
<b>Operations maintenance (also road maintenance)</b>	5
<b>Relationship between PW &amp; CDP</b>	1
<b>Public (funding)</b>	1
<b>Construction</b>	1
<b>Public Works Stormwater Management</b>	1
<b>Solid Waste/Facilities</b>	1
<b>Surface Water Management</b>	1
<b>Entire Municipal System</b>	1
<b>Private development</b>	1
<b>Special interests groups</b>	1
<b>Department of Ecology</b>	1

Ten interviewees identified elected officials as the location of concentrated barriers. Reasons included 'politics,' lack of council understanding relevant issues, budget approval, and turnover. One interviewee noted, "the [elected officials and/or administration] are more interested in their constituents and getting votes and maintaining what the public wants the government to be doing for them than necessarily hearing from what their department divisions think should be done, or how it should be done, or how it could be done." Nine of the circled concentrations were with the city or county manager or executive administration. The reasons varied but included lack of vision, support, appropriate prioritization, consistency, appropriation of funds, defined goals, promotion of unqualified staff and inability to empower subordinates. One interviewee describes their map,

*It's very hard to get fired, and there's very, very little motivation to do great work. Very little. Next to none actually, to think outside the box, to be creative, to go above and beyond, to work past four? To walk across the hall and coordinate because you think that's what should happen, but no one's told you to do that, so why would you?*

Municipal staff are reporting that barriers are most concentrated in their elected and appointed leadership.

Nine circled concentrations were with community and development planning, with some specifying that permitting was the particular concentration location. Some of the barriers included lack of public trust, relationship between public and front desk and permitting, personalities, lack of capacity, an unclear permitting process, and lack of financial support. One interviewee noted that community and development planning gives permissions for green infrastructure through permitting

and by doing so is the gatekeeper. Public works and operations received seven and five barrier concentrations visualizations, respectively. Reasons for the concentration varied widely between interviewees. Some reasons described included technical barriers, practicality and resources, while other interviewees noted internal inertia, resistance to change, and familiarity. The location of concentrated barriers was reinforced through the cognitive concept mapping exercise where respondents indicated the effectiveness of communication with red for ineffective, yellow for needs improvement, and green for effective.

### Social Network and Communication

The cognitive concept map asked interviewees to map out the effectiveness of the relationships and communication between departments within the context of green infrastructure and the shoreline master program. Interviewees mapped out these relationships and discussed them in the interviews. Figure 4.3 represents all relationship types that were indicated on the cognitive concept maps. The thickness of the lines is representative of the number of interviewees who identified the same quality of relationship between the same two parties. The height of the lines from the division and sub-division are irrelevant.

Interviewees generally cited intradepartmental relationships as effective (green), while interdepartmental relationships become more mixed and ineffective. There were a number of interviewees that both mapped and verbally described the primary divisions as “siloes” from one another. Other interviews made note of the spatial scales that exist in municipal buildings and structures, “these departments are very geographically separated.”

Interestingly, in one case study, a large Phase II urban city, all the interviewees agreed to the effectiveness of the relationships and the quality of collaborations. This case study had a unique planning structure that they described, “Unlike some organizations, our long-range planning team, we have a long-range planner in parks, we have long-range planners in public works, we have long-range planners in planning, which confuses people because they think they’re all on planning because we have one division named planning.” This case study described their planning team as being present within a number of divisions as well as having weekly meetings to discuss the issues pertaining to each division.

The most common relationship visualized on the maps was that of the relationship between public works and community and development planning. This was cited a number of times as needing improvement (yellow) and also as ineffective (red). The reasons as to the mixed and poor communication include disagreement as to what manual to use, “we kind of have this ... disagreement about which manual we're using and what the standard is between the two departments.” Also at issue is rapid change within fields of expertise and personalities of individuals involved. One interviewee complained of an engineer who had been in the department for decades and has not upgraded his skillset since they started.

*The reason I colored those yellow is primarily because the responsibilities in those areas overlap so much between the different departments or divisions that sometimes you just don't have that one person that's responsible. When you have multiple hands in the cookie jar it gets a little messy.*

*It's just an ongoing effort to catch up people with different viewpoints, different levels of expertise and so there's just a real need for ongoing communication to make sure you don't get the situation where you're treating one group different from another for different reasons.*

*We deal a lot with ... culture change where we have individuals who have been in those positions for 17, 15, 20 years sometimes or more who have done things a certain way and are not as open or reactive to change.*

There were multiple visualizations of poor communication between the executive administrative staff and line staff in various departments. One interviewee noted, "It starts at the top, and that's where problems and challenges, that's when things get difficult and we can't—it's huge. It just feels really heavy, and it feels like we can't overcome them." Another reported poor communication coming from the top.

*I can say that communication is poor, all around. So, it all starts at the top—what is the vision of the [elected officials]? Again, it's all about—where do they see us 5 years from now, 10 years from now? We don't get a whole lot of that.*

Suggestions on how to make the relationship move from red or yellow to a more effective (green) included the following examples.

*They should say this is who we are as a department and this is what our goals and objectives are. This is our -- this is how we do planning, this is what we want to achieve. I think that needs to happen and whether or not that comes from the administrator telling his directors this is how I want you to function or if it's more of a... they've got this high performing organization system in place where we're all supposed to feel empowered and make suggestions and... it's just modern, it's not revolutionary.*

*Impose more upon divisions to be green.*

*I think a big barrier is the city manager. I think that we have tried to promote the stormwater utility and describe the needs of it from both a staffing perspective and a goal of stormwater water quality and I think it doesn't get priority. There's a lot of bigger issues in the city.*

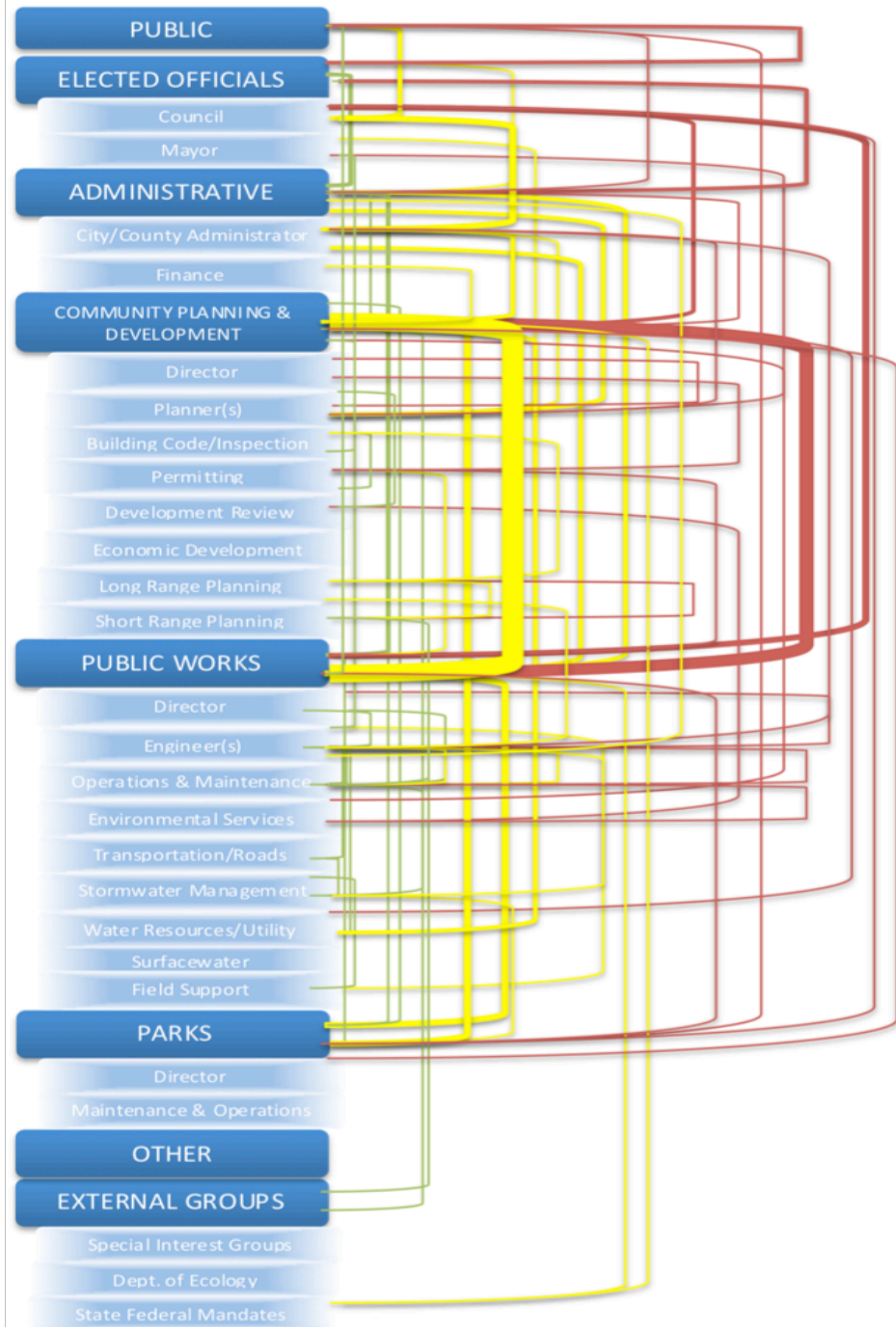
Another common relationship was that between the public and either elected officials and/or government staff. This relationship was commonly cited as ineffective. This was also one of the highest areas of concentrated barriers. An interviewee observes, "Some people want us to go do something because it's the popular thing, not the right thing." Interviewees described this lack of effective communication as due to misinformation.

*We spend so much time here at the city trying to correct public misinformation that it saps resources and time. And it's because there's so much information out there now that we're almost always on the defensive. We're -- I would say we spend almost as much time correcting*

*misinformation as we do communicating information because there's so much out there and people are so interconnected now and you can throw anything you want out on the internet and have absolutely no accountability.*

*I had yellow as communication between public works director and city manager in communication, but not in understanding stormwater problems very well or being able to communicate those to the city manager to be able to actually understand them.*

Figure 4.3 Cognitive Concept Map: Effectiveness of inter- and intra-department communication





The divisions and municipalities whose staff cited effective communication and relationships had a number of reasons as to why and/or what supported the ‘green’ effective relationship. “We have all the same values, and we're working towards the same goals, and we all try to help each other.” These values and goals are communicated through the “city comprehensive plan. And just through effective working relationships on a day-to-day basis among staff, line level staff.” Green infrastructure “is embedded in the culture.” Some attribute good relations to small size, “we aren’t a big bureaucracy.” “When we have a policy or goals that the council has given us clear direction on, the implementation is usually something we can communicate quite well.” “A lot of us have worked together for a long time – so we know each other very well. So when we work on projects, it’s a collaborative team approach.” One interviewee offered advice for better collaboration, “communication, learn to listen.” Some case studies had very effective communication and found shared values, smaller size, clear direction, collaboration, and longevity as key to their success.

### Communication in Survey Responses

The survey provided another way to evaluate the effectiveness of communication between municipal departments and divisions. Question 14 asked respondents to rate the effectiveness of communication between their current division and the following areas in municipal governments: planning, permitting, public works, surface water management, community development, parks, maintenance, airport, education and outreach, roads, natural resources, municipal manager/executive, elected municipal council, and other. Respondents could choose from a four-point Likert scale ranging from poor to very effective or could select N/A for not applicable.

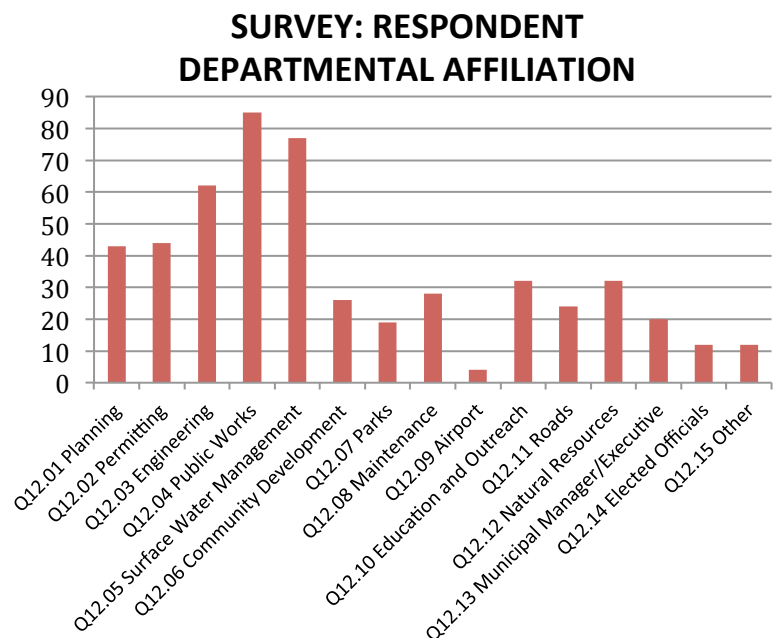
#### Q14. Municipal Structure: How would you rate the effectiveness of communication between your current division and the following areas in your municipality?

1 – Poor      2 – Needs Improvement      3 – Good      4 – Very Effective

Table 3.3 Survey: Descriptive Statistics of communication effectiveness between departments

Item	N	Mean
Q14.03 PUBLIC WORKS	134	3.17
Q14.04 SURFACE WATER MANAGEMENT	135	3.14
Q14.11 NATURAL RESOURCES	109	3.06
Q14.07 MAINTENANCE	144	2.94
Q14.09 EDUCATION & OUTREACH	122	2.93
Q14.10 ROADS	142	2.91
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	143	2.87
Q14.02 PERMITTING	138	2.83
Q14.01 PLANNING	141	2.80
Q14.13 ELECTED MUNICIPAL COUNCIL	142	2.73
Q14.05 COMMUNITY DEVELOPMENT	129	2.68
Q14.06 PARKS	141	2.68
Q14.08 AIRPORT	38	2.26

Figure 4.4 Survey: Number of survey respondents and departmental affiliation



**SURVEY: HOW WOULD YOU RATE THE EFFECTIVENESS OF COMMUNICATION BETWEEN YOUR CURRENT DIVISION AND THE FOLLOWING AREAS IN YOUR MUNICIPALITY?**

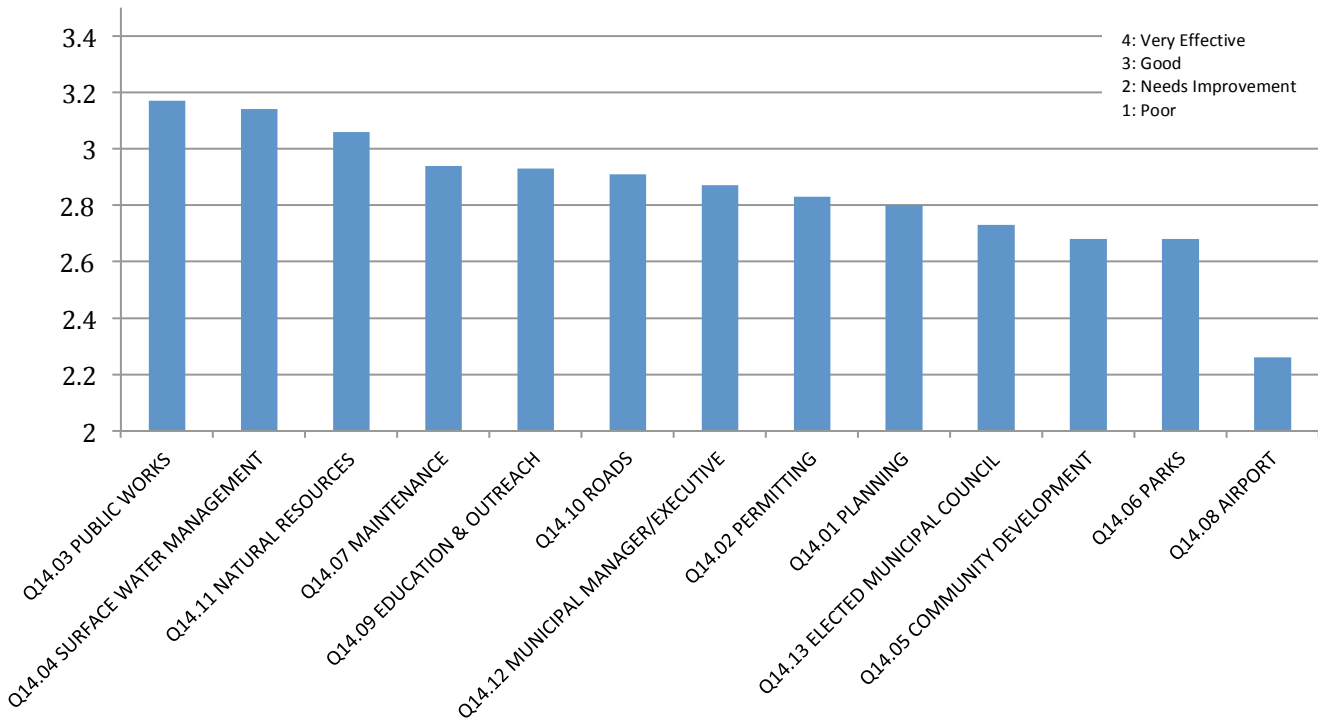


Figure 4.5 Survey: Descriptive Statistics: communication effectiveness

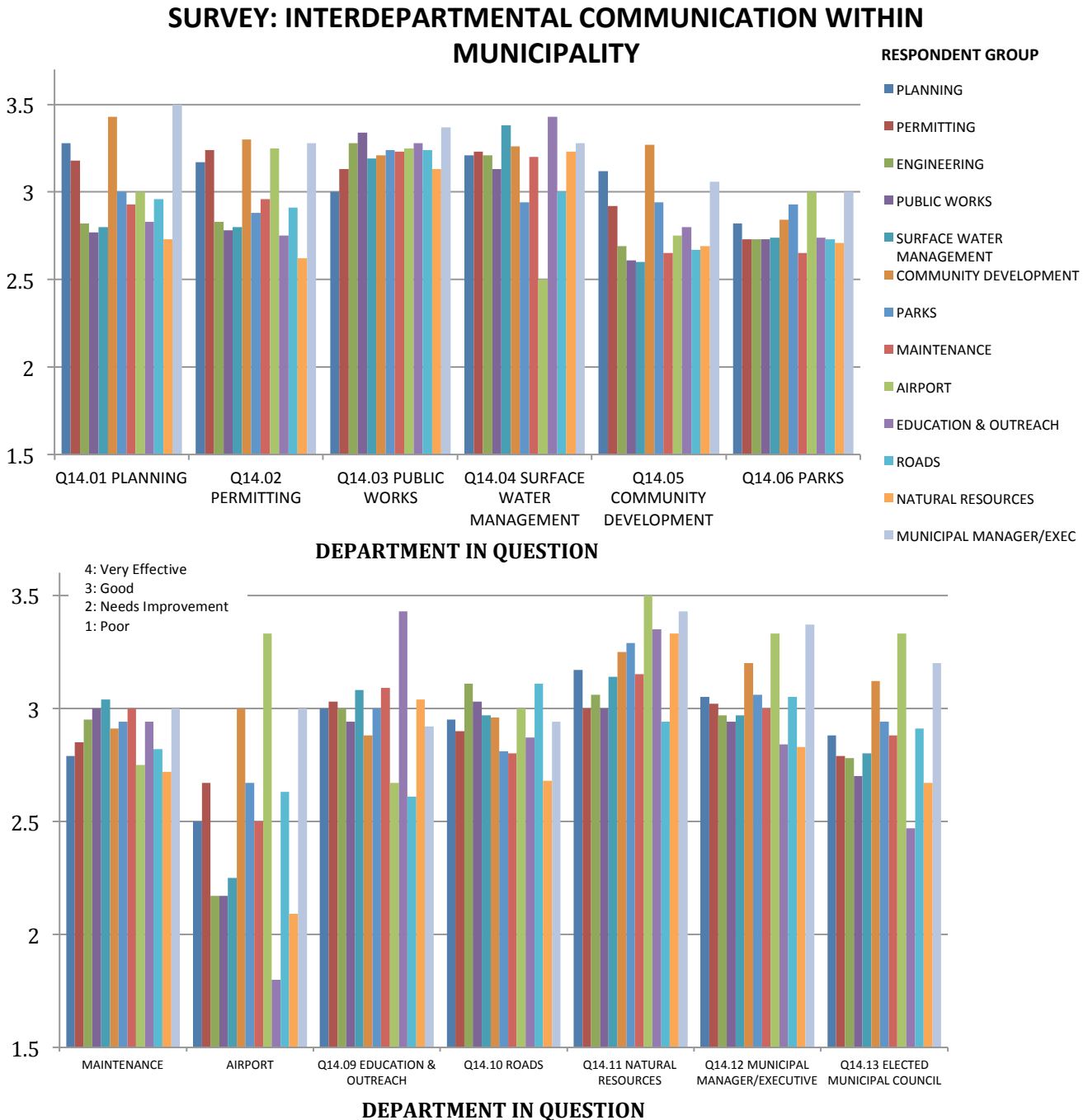
The survey asked respondents to rate the effectiveness of their departments’ communication with their own and other departments in their municipality. The highest ratings for communication effectiveness, rating between ‘good’ (3) and ‘very effective’ (4), are with public works, surface water management and natural resources. Consistent with our concept maps, strained communication is reported more frequently with municipal management and elected officials as well as with permitting, planning, and community development. The higher rating of communication with public works and surface water management is likely a product of the fact that more than 50% of our respondents identified themselves as being located in those municipal divisions.<sup>4</sup> Survey respondents were not restricted from rating communication with their own respective department. We can gain a finer resolution of the higher ranking of intradepartmental versus interdepartmental communication when we break the results down by respondent group.

Respondents regularly rate intradepartmental communication higher than most interdepartmental discourse. While public works and surface water management appear to have some of the better ratings overall, engineers report difficulty communicating with surface water

<sup>4</sup> Respondents could select more than one division, thus generating totals that exceed 100%.

management. Municipal operations such as airports and parks that may be removed geographically from other departments, if they exist at all some in some municipalities, have lower communication ratings from their peers. Peers report less effective communication with planning, permitting, and community development. Communication with maintenance hovers just under good (3) while that with municipal management and elected officials is at a similar level but with much more variability by department. Education and outreach staff, intriguingly, have the most strained relationship with elected officials, perhaps reflecting a perspective we often heard in the interviews: that elected officials themselves need to be better educated on green infrastructure.

Figure 4.6 Survey: Descriptive Statistics: Interdepartmental communication by department



Using the ANOVA statistical analysis, we see a few significant differences in communication effectiveness by municipal characteristics. Cities and counties varied when they described their departments' communication effectiveness with planning, community development, natural resources and the municipal manager/executive. Cities described their communications with these departments as 'good,' while counties scored these divisions much closer to 'needs improvement.' Very large and large sized jurisdictions have reported a lower average for communication effectiveness with planning, surface water, and community development. Similarly, communication across a broad range of departments is more difficult among Phase I permittees. Communication with planning and community development is more strained in urban areas while that with natural resources is more difficult in rural areas. Executive staff reported more effective communication across multiple departments, relative to middle management and especially line staff, whose interdepartmental communication is often more strained.

### SURVEY: ANOVA : CITY/COUNTY COMMUNICATION EFFECTIVENESS (Q1:Q14)

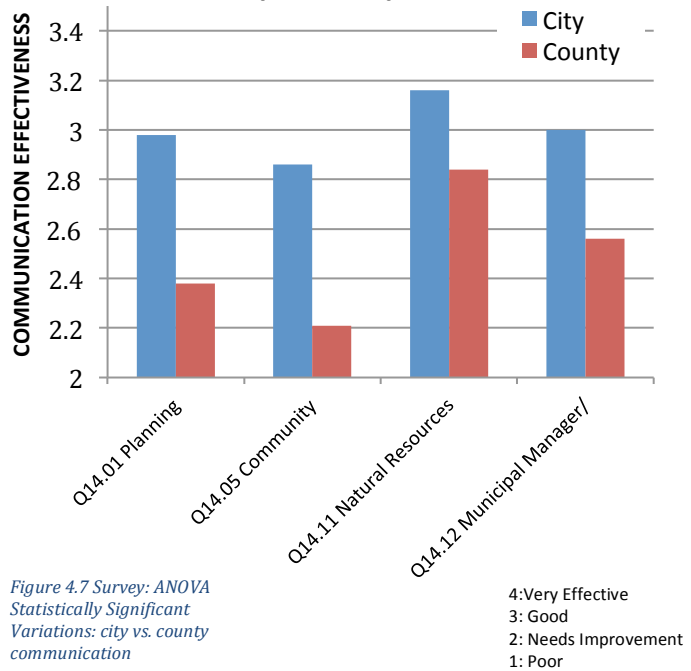


Figure 4.7 Survey: ANOVA Statistically Significant Variations: city vs. county communication

### SURVEY: ANOVA : PHASE I & II: COMMUNICATION EFFECTIVENESS (Q4:Q14)

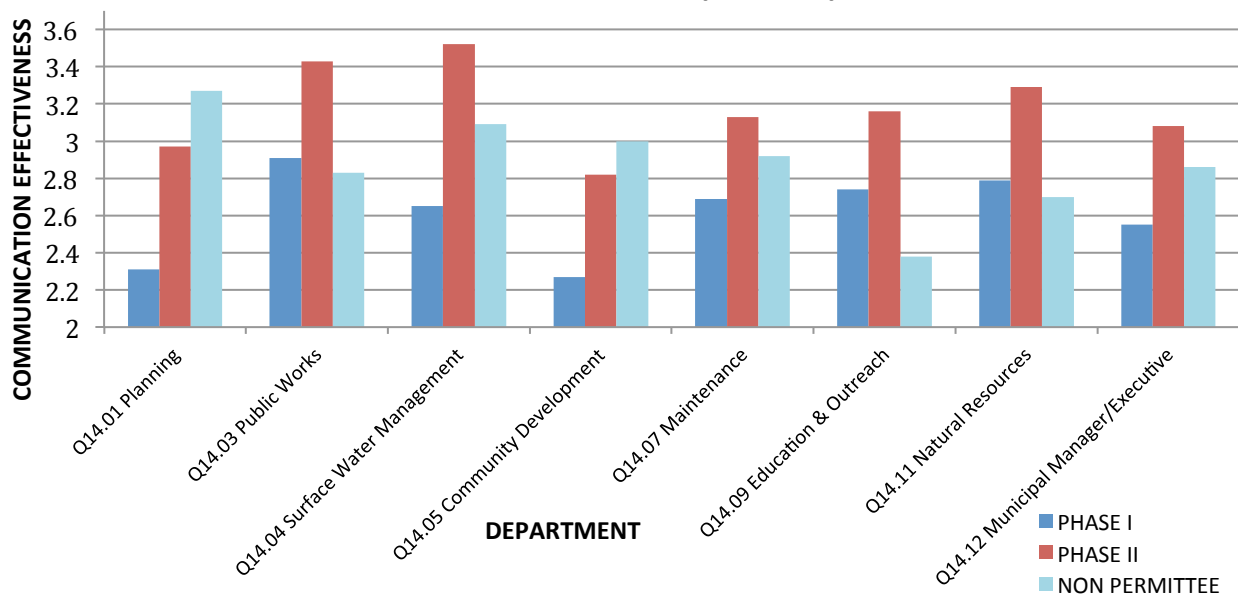


Figure 4.8 Survey: ANOVA Statistically Significant Variations: NPDES status communication

**SURVEY: ANOVA :  
URBAN/RURAL  
COMMUNICATION**

**EFFECTIVENESS (Q4:Q14)**

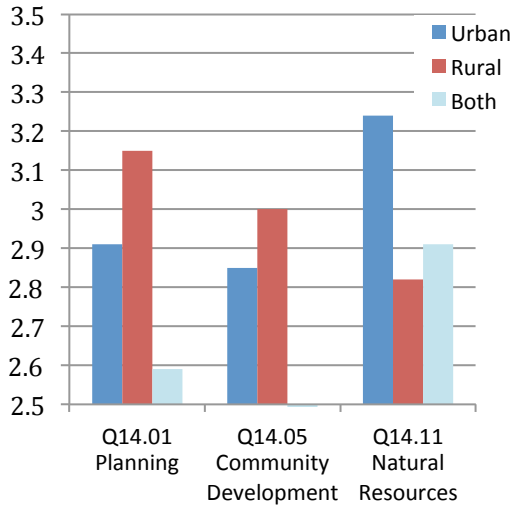


Figure 4.9 Survey: ANOVA Statistically Significant Variations: urban/rural communication

**SURVEY: ANOVA: JURISDICTION SIZE :  
COMMUNICATION EFFECTIVENESS  
(Q3:Q14)**

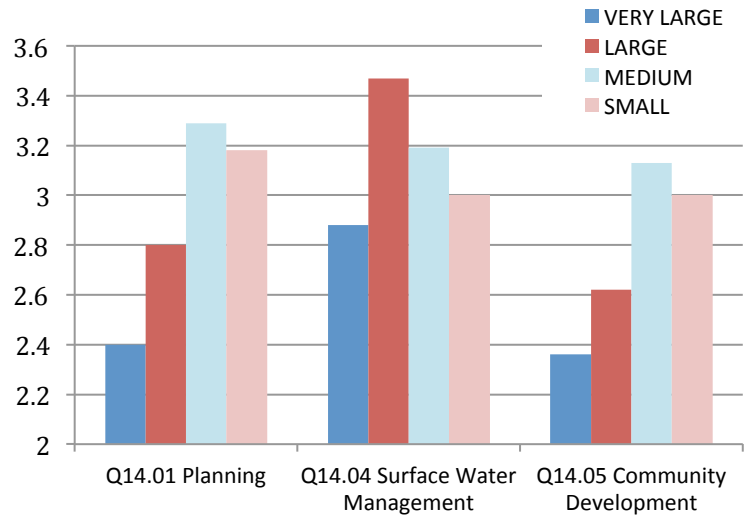


Figure 4.10 Survey: ANOVA Statistically Significant Variations: jurisdiction population

**SURVEY: VARIANCE IN COMMUNICATION BETWEEN STAFF  
HIERARCHY AND MUNICIPAL DEPARTMENTS (Q11:Q14)**

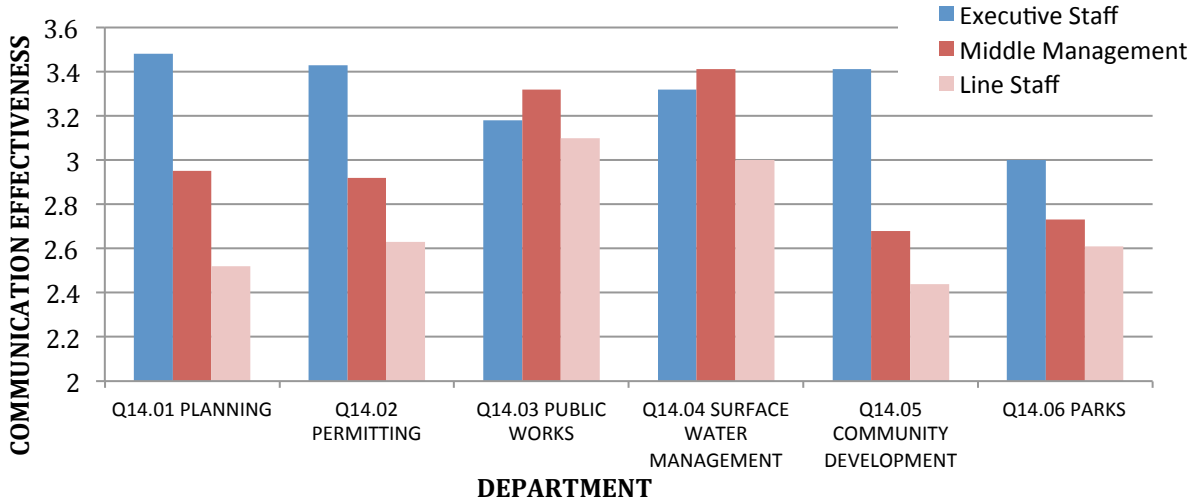


Figure 4.11 Survey: ANOVA Statistically Significant Variations: staff hierarchy communication

## Successful Implementation

Our survey also collected data on the implementation of different forms of green infrastructure in Puget Sound municipalities. The practices with the highest reported rates of adoption include critical areas ordinances, rain gardens, Shoreline Master Program, curb-side recycling, pervious pavement, environmental education, bike paths and lanes, tree preservation, and habitat restoration. Those with the lowest reported levels of adoption include economic analyses that include ecological valuation of natural resources, endangered species recovery plans, and wildlife corridors.

### SURVEY: SUCCESSFUL GREEN INFRASTRUCTURE PROJECTS IMPLEMENTED BY MUNICIPALITIES

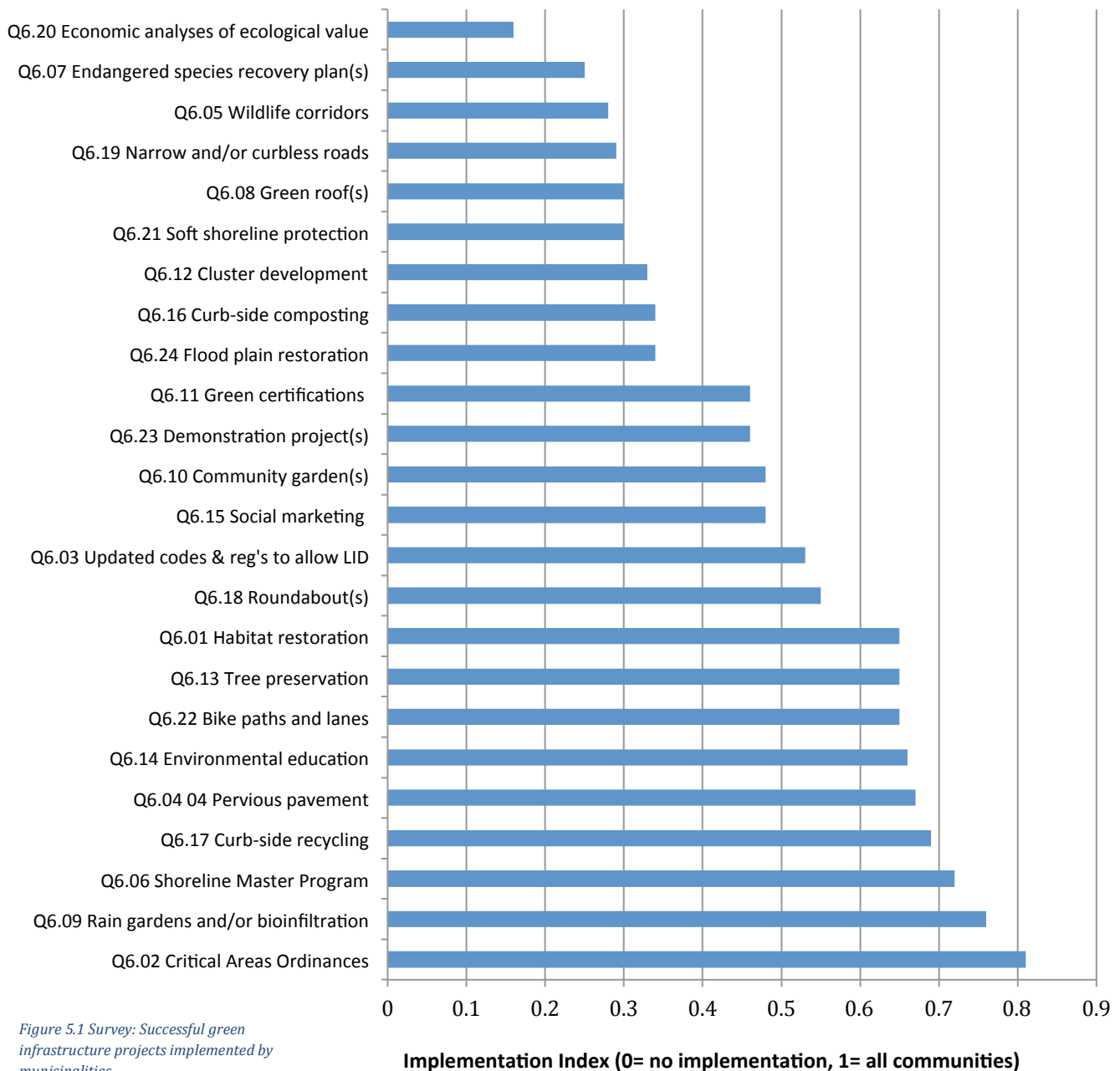


Figure 5.1 Survey: Successful green infrastructure projects implemented by municipalities

## Recommendations for Future Endeavors

*“How are we to enforce maintenance of pervious surfaces in backyards? What about having to install a new utility in an existing pervious asphalt road. For that matter, how do we maintain a pervious asphalt road over the years? In the past we’ve been able to grind and overlay, chip seal, etc. What do we do now? Construct a new street? I am all about smart development, but this feels like people with little understanding or concern about how things are maintained are forcing rules down our throat.”*

Effective Puget Sound recovery requires not only quality natural science inquiry and guidance, but is also dependent upon effective social sciences and resulting insights. Social challenges abound in the implementation of the Puget Sound Action Agenda. Much of the necessary recovery efforts is dependent upon local actions by municipal governments, guided by basin-wide goals and coordinated efforts. Municipal employees are often at the front-line of Puget Sound recovery and offer valuable insights into the barriers they encounter on a regular basis and strategies that they have used or would like to employ in overcoming these barriers.

Our recommendations for future research are built around the five critical steps for social marketing strategies. This study has identified integration of Puget Sound Action Agenda by municipal governments as a desired behavior change. It has identified a set of common barriers to target for reduction and desirable solutions that can address these barriers. The next steps in the process are to develop strategies for reducing these barriers to green infrastructure policy integration, pilot and evaluate these strategies, and then implement successful pilot strategies more broadly.

Municipal employees have identified maintenance, especially when it must occur on private property and be overseen by public agencies, as the most critical barrier to the use of green infrastructure in Puget Sound recovery. This puts the crux of the problem in the realm of human behavior, particularly that of private citizens who may not understand or have the knowledge and skills necessary to properly maintain pervious pavement, rain gardens, bioinfiltration, cisterns, green roofs, soft armoring, critical area buffers, etc. This social dilemma echoes that of the human behavior challenges of on-site sewage treatment systems (Murphy et al., 2009) but on a broader and deeper scale. Awareness of the maintenance challenge may be in part because of broad adoption by municipalities of rain gardens and pervious pavement. Municipal employees widely recognize education, training, social marketing, and behavior change as central components of the solution to this problem. While a majority of municipal employees report that their municipality engages in environmental education, less than half report the use of social marketing. If behavior change is the goal, social marketing is going to be more effective than environmental education alone. Efforts need to be directed towards closing the gap between installations of high maintenance infrastructure like rain gardens and behavior change endeavors that may need to accompany the physical structures. An alternative to the behavior change approach might be found in those municipalities that have taken upon themselves the responsibility for the maintenance of green infrastructure even when these systems are located on private property.

While maintenance may be the most pervasive problem, uncertainties in cost and performance of new technologies follow close behind. Likely related to this issue is project cost. While employees

note that green infrastructure is widely touted as being more cost effective, this has not been their experience. Uncertainty may be key to this discrepancy. Municipal employees express widespread fear of system failures and report designing and building back-up systems of traditional infrastructure alongside green systems. Maintenance also ties in here because some of the risk and liability is associated with life-cycle costs and performance. Conducting better analyses of cost and performance over the life-cycle of the infrastructure and communicating those with stakeholders may help here as will holding developers accountable for the cost of the environmental damage they may be causing. Failures are not unique to green infrastructure, lack of accountability even for failures of gray infrastructure may distort perceptions of cost. The fact that few municipalities are conducting economic analyses that include the ecological value of natural resources is also a likely contributor to the perception of higher cost of green infrastructure. While internal adoption of an ecosystem services approach to economics and external training for doing so are only rated in the mid-range of desirable solutions by municipal employees, the mean still falls between somewhat and generally helpful. The fact that green economics is one of the least adopted current practices suggests that perception of higher costs may be the result of incomplete economic analyses rather than a reflection of actual costs and benefits when the ecological value of natural resources is considered.

While there is significant variation in the perception of barriers by municipal characteristics, the overarching pattern is one of general agreement about the primary issues. Enforcement issues need to be addressed, especially in counties and rural areas. Conflicting priorities, silos, and strained communication are more prominent barriers in larger municipalities, especially Phase I permittees. The desire to break down the silos that have developed between public works and planning and community development exists on both sides of the divide. More effective leadership by municipal managers and elected officials could help bridge these communication gulfs. Actions to address prominent barriers such as maintenance, risk and liability, cost, legacy infrastructure, and insufficient enforcement can be expected to have widespread appeal across and within municipalities. Similarly, financial assistance with green infrastructure projects, cost and performance analyses, soil suitability maps, bringing diverse staff together to discuss communication challenges, training, social marketing, more effective enforcement, and increased advocacy of green infrastructure from upper management should be broadly welcomed by staff across and within jurisdictions.

Different perceptions between executive staff and line staff need attention. Executive staff and middle management presented themselves to us as advocates for green infrastructure and prided themselves on the accomplishments of their jurisdictions. The enthusiasm they presented to us is not getting through to line staff. This may be because of a difference between rhetoric and action, or it may be a lack of communication of a clearer vision and accomplishments by municipal leadership. Upper management needs to demonstrate commitment to green infrastructure with decisions and actions that reflect the priorities they espouse. Staff, likewise, presented themselves as individuals who favored sustainability and responsible stewardship of their public responsibilities. There appears to be much good will around which Puget Sound recovery effort can coalesce and come to greater fruition.

The silos and communication gulfs that divide surface water and public works on one side and planning, permitting, and community development should be addressed. Planning, permitting, and community development are perceived by their peers as the gatekeepers, often obstructing green infrastructure. Upper management holds a much more favorable view of communication with planning and community development than do their peers so it may be that those employees believe they are



acting as directed by management. Management may be directing them to act in ways that impede green infrastructure policy integration. Again, municipal leadership needs to ensure that green priorities are reflected in the actions of planning, permitting, and community development departments. Employees in public works and surface water management can work to build bridges with the knowledge that their peers in planning, permitting, and community development also desire more effective communication and a sustainable future for the Salish Sea.

## Conclusion

The recovery of the Puget Sound is at a critical stage. The Puget Sound Partnership has identified priorities, targets, indicators, and actions necessary for a balanced and healthy ecosystem. The Puget Sound Action Agenda provides recommendations for policy integration at the local level but various behaviors, structures, processes, resources and practices appear to be barriers to the implementation of policies fostering green and sustainable infrastructure. This rapid ethnographic assessment draws upon long-term engagement with Puget Sound communities, a literature review, participant observation, semi-structured interviews, an online survey, and document analysis to identify key barriers to and potential solutions for the integration of green infrastructure in municipal governments. These mixed methods reveal patterns in barriers across different types of municipalities and within staff hierarchies of local cities and counties of the Puget Sound basin and recommend internal and external changes that might facilitate recovery and promotion of a healthy and sustainable Salish Sea.

Social issues should be integral to future endeavors to advance green infrastructure as a strategy for Puget Sound recovery. Maintenance of dispersed infrastructure on public and private properties is a preeminent concern across the region. Clearer measures of the cost and performance of these structures is needed. More effective economic analyses that value ecosystem services and natural resources need to be integrated across decision-making processes in municipal governments. Public education and social marketing are needed to ensure that private property owners have the knowledge, skills, and ability to ensure the proper maintenance of dispersed installations of green infrastructure. The recovery of the Puget Sound is dependent upon swift and decisive action by elected officials, municipal management, line staff, and everyday citizens. Together we can help to ensure a greener and more sustainable future for the Salish Sea that we all share.

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## Appendix A

### Literature Review

#### Overview

Recovery of the Puget Sound is more than a scientific and technological endeavor. Sustainable solutions require attention to human factors that contributed to the current situation and that may slow or accelerate efforts to achieve a balanced and healthy ecosystem. This literature review summarizes social scientific research related to green infrastructure policy integration in Puget Sound municipalities. It includes an historical and legal overview of the Puget Sound Action Agenda, its strategic initiatives, their importance, and the role of municipalities, stormwater management, low-impact development (LID) and Shoreline Master Programs (SMPs) in its implementation. It concludes with a review of methods employed in social scientific research on barriers and gateways for green infrastructure nationally and internationally. Results of that research appear in a narrative summary and in a comprehensive table under the general categories of technical and physical, legal and regulatory, financial, and community and institutional.

This review establishes a base set of known barriers to green infrastructure implementation and possible solutions within a global context. This summary derives from international, national, and regional sets of interviews, inquiries, and surveys in published literature. Most of the national data comes from east of the Rocky Mountains in the United States and the extent to which these barriers are reflective of the challenges faced by municipal employees in the Puget Sound region remains unclear. Existing studies have aggregated data from municipal employees with responses from community members, developers, non-governmental organizations, and/or federal and state agencies. As a result, patterns specific to municipal employees within the region, across jurisdictions, and across staff hierarchies have yet to be identified.

#### Puget Sound Action Agenda

Governor Christine Gregoire, with the approval of the Washington state legislature, created the Puget Sound Partnership as a state agency in 2007. The new agency's purpose is to manage the recovery of Puget Sound with a target for recovery by 2020. The Partnership combined the jurisdiction of two precursory administrations—the Puget Sound Action Team and the Shared Strategy for Puget Sound. The Puget Sound Action Team was a program within the Governor's Office; the Shared Strategy for Puget Sound was a nongovernmental organization with a grassroots recovery plan for threatened salmon populations in the region (Wellman et al., 2014a). The Partnership brings together a broad spectrum of stakeholders (public, government entities, tribes, scientific experts, and private companies) to set priorities, execute a recovery plan, and ensure accountability for results. The Puget Sound Action Agenda expresses these collective priorities through a plan of action. While not a regulatory document, the Action Agenda serves as a guide to the recovery of Puget Sound by establishing objectives and creating a structure for how, through collaboration, a healthy Puget Sound environment becomes attainable.



Initially published in 2008 the Action Agenda is updated in 2-year intervals to represent the headway made, lessons learned, and new challenges identified (Puget Sound Partnership, 2014a). In 2012, the Action Agenda update included three strategic initiatives to facilitate prioritization of targets:

- *Prevention of pollution from urban stormwater runoff.*
- *Protection and restoration of habitat.*
- *Recovery of shellfish beds.* (Puget Sound Partnership, 2014a, p. 3).

Strategic Initiatives give focus and priority to investment of efforts and resources by the Partnership. In order to make significant progress quickly the Action Agenda prioritizes near-term actions with practical solutions for reducing pollution from urban stormwater runoff, protecting and restoring habitat, and recovery of shellfish beds (Puget Sound Partnership, 2014b). These strategic initiatives address important components of the ecosystem, cultures, and economy of the Puget Sound region.

Prevention of pollution from urban stormwater runoff is a priority. The negative consequences of polluted stormwater runoff stemming from urbanization (contaminated with chemicals, nutrients, sediments, and bacteria) are major threats to the quality of surface water (Barbosa, Fernandes, & David, 2012; Dietz & Clausen, 2008; Dochow, 2013; Gaffield, Goo, Richards, & Jackson, 2003; Goonetilleke, Thomas, Ginn, & Gilbert, 2005; Puget Sound Partnership, 2014b; Spromberg & Scholz, 2011). The population is projected to grow by about 1 million people by 2025 (Puget Sound Partnership, 2014b; Wellman et al., 2014a). Traditional land development practices have resulted in the proliferation of impervious surfaces that combined with land-clearing processes introduce damaging contaminants to the waters of Puget Sound. These pollutants can have harmful effects on both human and non-human inhabitants of the ecosystem (Gaffield et al., 2003; Goonetilleke et al., 2005; Puget Sound Partnership, 2014b; Spromberg & Scholz, 2011). Stormwater runoff, as a nonpoint source of pollution, is more challenging and expensive to regulate than point sources and thus will necessitate the collaboration of various stakeholders, including municipalities (Abhold et al., 2011; Lin, Deng, & Gang, 2009; Lombard, 2006; Puget Sound Partnership, 2014b). Municipal regulation of urban stormwater is vital to the recovery of the Puget Sound.

Protection of the Puget Sound's vital habitats and their associated biodiversity is another priority. Negative impacts of anthropogenic alterations to the Puget Sound environment have contributed to the addition of marine birds and salmonids to the federal Endangered Species list (Lombard, 2006; C. W. May, Horner, Karr, Mar, & Welch, 1997; D. Montgomery, Bolton, Booth, & Wall, 2003; Puget Sound Partnership, 2014b). Habitat loss, specifically, is a primary driver of decreases in biodiversity, especially for species that are sensitive to urbanization on small and large scales (Bilby & Mollot, 2008; Feely et al., 2010; Morley & Karr, 2002; Puget Sound Partnership, 2014b). Shoreline modification has disturbed the natural processes that maintain Puget Sound beaches, reducing forage fish spawning habitat, and eliminating floodplains used by fish as resting and feeding sites (Collins, Montgomery, & Haas, 2002; Penttila, 2007; Pess et al., 2002; Puget Sound Partnership, 2014b). Puget Sound has lost a substantial amount of its estuarine habitat, vital for salmon and forage fish alike (Feely et al., 2010; Fresh, 2006; D. Montgomery et al., 2003; Penttila, 2007; Puget Sound Partnership, 2014b). The collective impact of the changes humans have made to the Puget Sound environment has resulted in a substantial loss of habitat and population decreases of the species that depend on those areas and a functioning ecosystem for their very existence. If their survival is to be ensured, continued habitat

loss must cease and restoration of that which has already been lost must occur (Bilby & Molloy, 2008; Lombard, 2006; C. W. May et al., 1997; D. Montgomery et al., 2003; Morley & Karr, 2002; Puget Sound Partnership, 2014b). Municipal protection of shorelines, riparian zones, and other habitats is integral to Puget Sound recovery.

Among the various habitats under threat, shellfish beds receive strategic emphasis in the Action Agenda. Shellfish have long served as a foundational element in the ecological, cultural, and economic history of the Puget Sound; yet they too have fallen prey to the effects of pollution in our contemporary regional environment (Dethier, 2006; Feely et al., 2010; Fisher & Velasquez, 2008; Lynn et al., 2013; Puget Sound Partnership, 2014b). Shellfish are an important traditional food for Coast Salish communities. “The indigenous relationship between food and people is intimately tied to the cultural, physical, emotional, psychological, and spiritual health of tribal communities” (Lynn et al., 2013, p. 547). Presently, nearshore shellfish in the region contribute a commercial value of around \$100 million annually (Dethier, 2006; Puget Sound Partnership, 2014b). Shellfish also provide ecological benefits including filtration of nearshore waters which bolsters water quality (Dethier, 2006). Cyclically, shellfish in turn require a high level of water quality to function as a commercial food source leaving them vulnerable to the consequences of the aforementioned anthropogenic changes to the environment (Dethier, 2006; Frenzl, Redekopp, Neal, Murphy, & Velasquez, 2007). Municipal protections of shellfish beds are important components of Puget Sound recovery.

### Legal Context for Green Infrastructure

Municipal regulations impacting the Puget Sound are subject to state and federal law governing water quality and protecting endangered species. The Federal Water Pollution Control Act of 1972 was the first environmental statute to nationalize the matter of water pollution control in the US. Subsequent amendments include the Clean Water Act of 1977 (CWA), the Water Quality Act of 1987 (WQA) and the Oil Pollution Act of 1990. These laws aim to control water pollution by regulating point and non-point source discharges to US waters. They prohibit such discharges unless the emitter fulfills a set of requirements including mandatory duties, regulatory schedules, and deadlines.

Water quality, including stormwater, is primarily regulated via the federal Clean Water Act and is administered by the Environmental Protection Agency (EPA). The EPA delegates authority for the nonpoint source pollution and related stormwater provisions of the Clean Water Act to the states in most cases. In Washington State, permit authority for discharges from municipal stormwater systems is in the purview of the Department of Ecology. Ecology, in turn, requires local governments to take specific stormwater pollution control actions and enforces those requirements through municipal permits. In general, nonpoint source pollution is mobilized by stormwater, which is then collected and concentrated in municipal (i.e., city, town, or county) stormwater systems. Municipal systems eventually discharge to a natural water body, creating a point source that is regulated by permit. Comparable permit systems for industrial and tribal stormwater discharges exist but the focus here is on municipal governments.

The CWA puts the states’ authority in a secondary, supportive role. The new, uniform system of discharge rules implements a command-and-control governing method and employs a permit program for enforcement. The National Pollutant Discharge Elimination System (NPDES) permits facilitate the translation of regulations into enforceable requirements of the discharger (Andreen, 2004; Kubasek & Silverman, 2014). Conventional and nonconventional pollutants must be treated using best

conventional treatment (BCT) and best available technology (BAT), respectively. Municipal wastewater treatment plants must comply to stricter standards than those of non-governmental dischargers (Kubasek & Silverman, 2014). The NPDES permits for municipal separate storm sewer systems (MS4s) direct municipalities to develop policies, codes, and standards that protect state waters from the damaging consequences of stormwater discharge (Dochow, 2013). Washington Department of Ecology began its implementation of the NPDES stormwater program with Phase 1 permits in 1995, and revised Phase 1 permits in 2007 and added Phase 2 permits. Phase 1 permits apply to municipal stormwater discharge permits for communities with populations over 100,000 (Lin et al., 2009). A recent Washington court ruling in 2008, mandated that Phase 1 NPDES permit holders require, where feasible, the use of Low-Impact Development (Locklear, 2009). Thus, the regulatory framework for municipalities under state and federal governments differs upon the basis of population size.

Recognizing that plants and animals function as key natural resources, Congress enacted the Endangered Species Act (ESA) of 1973 to protect species at risk of extinction. ESA requires the development of recovery plans for each listed species so long as the plan would aid in its recovery. The ESA defines “endangered” as any species that is in danger of extinction throughout all or a significant portion of its range and “threatened” as any species that is likely to become an endangered species within the near future throughout all or a significant portion of its range (U.S.C., 1973). The ESA’s purpose, as put forth by Congress, is to enable the preservation of ecosystems in which endangered species persist, to conserve endangered species, and to facilitate international-level species protection (Kubasek & Silverman, 2014). The 2008 Puget Sound Partnership Act designated the Partnership as the regional salmon recovery organization, a responsibility previously held by the Shared Strategy (Brock, Leschine, & Weber, 2008; Puget Sound Partnership, 2015).

In 1972, the federal government asserted a nationwide interest in the management of coastal habitats with the adoption of the Federal Coastal Zone Management Act. The Act supported states in creating and applying comprehensive ecological, cultural, and aesthetic policies. By 1980, the Coastal Zone Management Improvement Act passed and provided for beach conservation by setting a national policy to support states in protecting natural resources. This has resulted in the positioning of decisions related to estuarine resources within the wide context of the Coastal Zone Management Act. Each state now has a comprehensive set of resource and development policies as a result of this program (Nordstrom, 1992).

In November 1972, the people of the State of Washington enacted the Shoreline Management Act (RCW 90.58). The primary purpose of the Act is to provide for the management and protection of the state's shoreline area resources by planning for reasonable and appropriate uses, including expected future uses. The future is defined through the goals developed for land and water use elements: economic development, public access, circulation, recreation, shoreline use, conservation, historical/cultural protection, and floodplain management (Department of Ecology, 2015). The Act calls for a comprehensive, localized plan, zoning ordinance and development permitting system. This plan, called the Shoreline Master Program (SMP), requires municipal governments, with support from the Department of Ecology to manage shoreline development. Management responsibilities can include any of the following: agriculture, aquaculture, forest management, commercial development, marinas, mining, outdoor advertising and signs, residential development, utilities, ports and water related industries, bulkheads, breakwaters, jetties and groins, landfills, solid waste disposal, dredging, shoreline protection, road and railroad design, piers, and recreation (City of Anacortes, 2010;

Department of Ecology, 2015). Local governments have the primary responsibility for initiating the planning program and administering the regulatory requirements in accordance with the policies and requirements of the Act and the State Shoreline Guidelines (WAC 173-26).

The Partnership and Department of Ecology have created multiple avenues of learning and integration for local governments to meet current standards and comply with federal and state mandates pertaining to the NPDES permitting, Shoreline Master Program, and Endangered Species Act. Some of these support systems include publishing a Low Impact Development Technical Guidance Manual, a Low Impact Development Code Update and Integration Toolkit, Shoreline Master Program Toolkit, educational videos directed towards elected officials, and offering free LID implementation classes open to interested and relevant parties (Catalog, 2015; Hinman, 2005; Washington Department of Ecology, 2014). Effective recovery strategies at the Puget Sound basin level are dependent upon collaboration between the state and local municipalities.

## Municipalities

The Puget Sound Partnership works within a twelve county region that is home to more than 100 cities and towns encompassing over 4.3 million people (Ward et al., 2014b; Wellman, Biedenweg, & Wolf, 2014). There are 19 major watersheds and over 10,000 streams within the 1.6 million acre region, including over 2,500 miles of shoreline (Puget Sound Starts Here, 2015; Wellman et al., 2014a). Municipal governments bear a primary responsibility for building sustainable communities and addressing the health of the ecosystem through a variety of measures, including green infrastructure and low impact development (Visitacion et al., 2009). Municipalities are valuable place-based settings for initiating concrete actions towards building sustainable societies (Stuart, Collins, Alger, & Whitelaw, 2014; Wamsler, Luederitz, & Brink, 2014). The county and municipal governments of the twelve county Puget Sound region demonstrate a variety of institutional structures, levels of compliance with regulations, enforcement styles, funding mechanisms, facilities organization and management, culture, size, organization of duties and responsibilities (P. J. May & Wood, 2003; Washington State Legislature, 2014). However, all share a regional watershed, and are under state and federal mandate to improve the health of the regional ecosystem.

Counties, cities and towns fall under the jurisdiction of the federal and state laws, but they also can create their own ordinances and codes through council legislation. Local governments are responsible for permit administration of local roads, parking lots, shoreline development (associated with the Shoreline Master Program) and buildings. Along with permitting, local governments provide communication with residents, county works and utilities, and manage water quality (Ward et al., 2014b). Over the past few decades, there has been a shift from a heavy handed top-down regulation of intergovernmental efforts towards a “more flexible regulatory approach,” that emphasizes co-production, co-planning, and cooperative policies (P. J. May, 1995; Stuart et al., 2014). This coordination is an important component of the Action Agenda.

Systematic integration of ecosystem services into municipal planning helps address the inherent linkages between nature and human well-being. Realized, this integration, has the hopeful potential to harmonize human-environment systems and foster sustainability transitions (Wamsler et al., 2014). Municipalities are responsible for planning for growing population and increased development in coastal areas while enhancing nearshore marine and estuarine ecosystems. Adaptive management, ecosystem-based management, private-public partnerships, inter- and intra-

governmental collaboration, and environmental citizen stewardships are all strategies to address these challenges (Stuart et al., 2014; Thom, Williams, & Diefenderfer, 2005; Wellman et al., 2014a). Research from municipalities in Sweden show that mainstreaming sustainability tools (ecosystem based management and ecosystem services) in municipal government, linked with vertical and horizontal synergy and strong leadership has been effective in moving sustainability into the core of municipal decision making (Wamsler et al., 2014). This is particularly important in the Puget Sound basin where multiple interacting governments, organizations, and social, cultural and environmental conditions demand a coordinated and synergistic approach to management.

The Puget Sound region has increasing pressure from population growth, urbanization, and subsequent industrialization. This has led to an increase in harmful contaminants, pollutants, increased shoreline modifications, shoreline armoring and an urban sprawl (Thom et al., 2005; Wellman et al., 2014a). In order to combat these increasing pressures, while simultaneously restoring and improving the Puget Sound, local governments are tasked with the development and review of permits, ordinances, regulations and standards. These may include the development and review of engineering and street standards, clearing and grading ordinance and standards, parking requirements, individual zoning district bulk and dimension regulations, subdivision standards and landscaping and tree standards among others (Puget Sound Partnership, 2012). Municipal governments are crucial players in the efforts to implement green infrastructure and low impact development projects that improve and restore the health of the Puget Sound and build sustainable communities.

## Green Infrastructure

In urban development, green infrastructure is increasingly favored over traditional or grey infrastructure. This process is driven by adaptive management processes, increased ecosystem services based management, and environmental regulations and mandates (Farber et al., 2006; Wamsler et al., 2014). Historically, in urban and developing areas, development consisted of turning vegetative lands, such as grasslands and forestland, into impervious surfaces that include parking lots, roads, and rooftops (Wissmar, Timm, & Logsdon, 2004). The EPA describes green infrastructure (GI) as using “vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water” (US EPA, 2014). Green infrastructure mimics natural systems to enhance ecosystem services including supportive functions and structures (nutrient cycling, hydrological cycle), regulating services (waste regulation, soil retention), provisioning services (water supply, food) and cultural services (recreation, aesthetic) (Farber et al., 2006; Locklear, 2009). Green infrastructure, as opposed to grey, facilitates the use of ecosystems services in the management of a developed landscape.

Low Impact Development (LID) is a hydrological component of green infrastructure. The *Technical Guidance Manual for Puget Sound* defines LID as “a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation and use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design” (Hinman, 2012, p. 10). LID technology includes pervious surfaces, functional grading and open channel

sections, disconnection of hydrologic flowpaths, bioretention/filtration landscape areas, microstorage, functional landscaping, increased runoff travel time, permeable concrete, rain barrels, rain gardens, and vegetative roof tops, among other techniques (Abhold et al., 2011; Bowman & Thompson, 2009; Hinman, 2005; Keeley et al., 2013; Locklear, 2009; Mazzotta, Besedin, & Speers, 2014; US EPA, 2011). These approaches help keep rainwater out of the sewer system which can lead to sewer overflows in some municipalities while also reducing the amount of untreated runoff discharged to surface waters. Green Infrastructure technologies, as a broader category, help address common impacts of stormwater runoff such as flooding and property damage, water-quality degradation, destruction of estuarine and freshwater habitat, and natural resource losses (Hinman, 2005; Roy et al., 2008; Visitacion et al., 2009). Despite economic, social, and environmental benefits, there is uneven implementation of green infrastructure and LID by municipalities (Abhold et al., 2011; Stuart et al., 2014; Wamsler et al., 2014). Because of the importance of hydrology in our region, LID is one of the most visible components of green infrastructure along the Salish Sea.

### **Municipal Organization**

The organization of municipal governments may contribute to where and how green infrastructure is, or is not, implemented. Municipal operations are divided into vertical and horizontal organizational coordination. Horizontal coordination includes add-on, programmatic, and inter- and intra-organizational relationships and interactions, while vertical coordination includes regulatory, managerial and direction resources, employees, and systems (Wamsler et al., 2014). The vertical dimension refers to implementation by powerful governmental bodies (such as elected councils) and to conditions that are characterized by strong guidance by core legislative powers or actors during the integration process. Horizontal dimensions can be defined as processes that refer to the implementation by less powerful entities (such as departments), and specifically to “conditions that are characterized by a single department or actor that encourages or coordinates mainstreaming but has insufficient authority to exercise top- down control” (Wamsler et al., 2014). Research shows that operations within municipal governments, across departments, and at times within departments separate related activities and may impede comprehensive approaches to problems.

Many governmental variables influence the success of managing healthy social ecological systems. These governance variables may include network structure, property-rights systems, operational rules, collective-choice rules, constitutional rules, and monitoring and sanctioning processes (Ostrom, 2009). Staff hierarchies within municipalities consist of formal rules, those of the law, and informal ‘working’ rules, or social rules. Working rules are the set of rules to which participants would make reference to if asked to explain and justify their actions to fellow participants (Ostrom, 2011). Interactions between individual staff, office, and programs within a municipality can be seen as interacting within either formal or informal working rules. These social relationships can influence the level of success in implementation of green infrastructure and low impact development.

### **Institutional Structure**

Implementing green infrastructures through municipal planning and code integration is a complex process that involves understanding the dynamics of the local government bureaucracy. Networks within government organizations involve influence, authority bonds, exchange relations, and coalitions based on common interest (L. J. J. O’Toole, 1997). Overlooked for years as unimportant government players, municipalities are now seen as integral players in government interdependencies

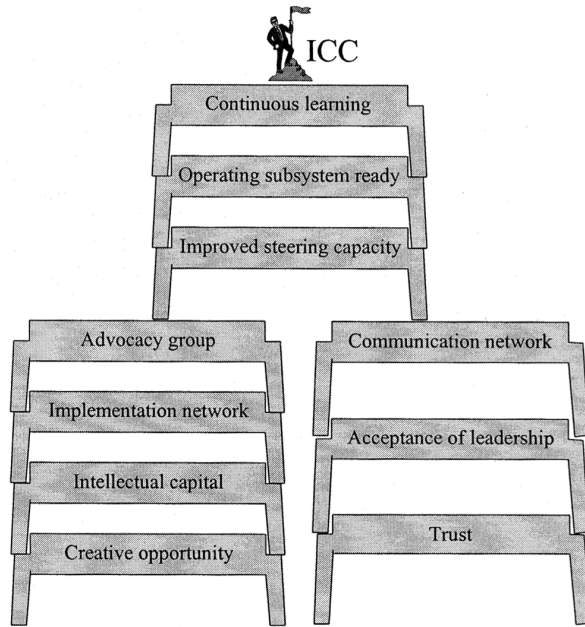


and as policy implementers. The United States has multiple overlapping governments, where federal, state, county, city, and town governing structures interact vertically and horizontally through a series of intergovernmental processes (Agranoff, 2012). Municipalities have both external and internal structures that impact the implementation of green infrastructure.

Local governments are inextricably linked vertically to their states/provinces and to their general governments through a range of national state (provincial/regional) programs, legal and fiscal considerations, and are horizontally linked with associated local governments and nongovernmental organizations through partnering, contracting, or other forms of externalization (Agranoff, 2012, 2013; Bardach, 2001). Within municipal governments are informally created networks that are not part of the traditional bureaucracy, yet involve influence, authority, bonds, exchange relations, and coalitions based on common interest (L. J. J. O’Toole, 1997). As the proverbial

institution ‘low in the food chain,’ municipal governments “experience a serious lack of powers in areas important to them as well as adequate economic resources to face the responsibilities assigned to them or those they would like to assume” (Agranoff, 2012, 2013). Multiple interacting sub processes with many actors, along with evolving policies, programs and administrative organizations make it difficult to study, anticipate, and understand these governments (Bardach, 2001; Ostrom, 2011). There have been various studies that look to understand and simulate interagency collaborations and policy development, however, these studies stress the complexity and need for further analysis (Bardach, 2001). Although, research shows that high inter-organization collaborative capacity (ICC) is achieved through a number of characteristics that work synergistically to achieve productivity and growth. See diagram above (Bardach, 2001). The complex, dynamic, and evolving nature of the local government structure is essential in identifying and recognizing barriers that stall or inhibit green infrastructure implementation.

**Each New Capacity a Platform for the Next**



(Bardach, 2001)

**Social Science in the Puget Sound**

The Science Panel for the Puget Sound Partnership has endorsed social science research in the implementation of the Action Agenda. Social Science research “enhances our understanding of the human dimension in ecosystem recovery in order to more efficiently and effectively implement actions

and support decisions that transparently assess tradeoffs that must be made in identifying robust recovery actions” (Puget Sound Partnership, 2013, p. 10). Attention to the human role in ecosystem recovery is vital for the recovery of large-scale ecosystems such as the Puget Sound (Wellman et al., 2014a; Williams, Levin, & Palsson, 2010). Social scientists have demonstrated the historical importance of humans in the evolution of Puget Sound ecosystems (Barsh, 2003; Storm & Shebitz, 2006; Storm, 2004; Weiser & Lepofsky, 2009). A social network analysis of collaboration within the Puget Sound nearshore and marine research community illustrated the need for more collaboration between natural and social scientists (Hoelting, Moore, Pollnac, & Christie, 2014). This local necessity is complemented by a growing awareness of the need for collaborations between social and natural scientists more generally (Alberti et al., 2003; Charnley & Poe, 2007; Cheng, Kruger, & Daniels, 2003; Endter-Wada, Blahna, Krannich, & Brunson, 1998; Liu et al., 2007; Lowe, Whitman, & Phillipson, 2009; Ludwig, Mangel, & Haddad, 2010; Nyhus, Westley, Lacy, & Millier, 2002; Wyllie-Echeverria, Arzel, & Cox, 2000). Social scientists are now widely recognized as necessary collaborators in Puget Sound recovery.

Social scientists are making broad contributions towards improving the efficiency and efficacy of the Action Agenda. An analysis of the costs and benefits of stormwater management used the Puget Sound as a case study (Visitacion et al., 2009). The Partnership’s use of ecosystem services as a common language between social and natural scientists has demonstrated the concept’s usefulness in integrated ecosystem-based management (Granek et al., 2010). A pilot study has illustrated the complex interrelationships between climate change and Indigenous community health (Donatuto et al., 2014). Another pilot project in Hood Canal has helped develop scientifically valid, replicable, and practical human wellbeing indicators as metrics for ecosystem recovery (Biedenweg et al., 2014). The development of a Sound Behavior Index provides a tool for measuring behavior change over time across the region and at separate county levels (Ward et al., 2014b). Semi-structured interviews and cognitive mapping exercises with environmental stewardship professionals have illustrated the high value seasoned practitioners place upon social outcomes in addition to ecological ones (Wolf et al., 2013). A social survey found correlations between measures of public/private collaboration and social success of Puget Sound Marine Protection Areas (Hard et al., 2012). The social sciences have much to offer an integrated approach to Puget Sound recovery.

Anthropologists have contributed to the social science of the Puget Sound through both rapid and traditional ethnographic research. Using a *sondoe* (sound out) rapid appraisal technique, anthropologists have developed recommendations for collaboration in the greater Seattle organic produce market and assessed understandings of water quality issues in Mason County (Butler, 1995). Ethnobiologists have demonstrated the importance of recognizing culturally significant keystone species (Garibaldi & Turner, 2004). Rapid ethnographic assessments using semi-structured interviews have helped inform a social marketing campaign directed at behavior change of homeowners in the care of septic systems in Snohomish County (Murphy et al., 2009), documented the perspectives of gleaners, gatherers, and municipal officials in Seattle as urban forests evolve in the context of increased investments in green infrastructure (McLain, Poe, Hurley, Lecompte-Mastenbrook, & Emery, 2012), and evaluated non-technical human project management elements of wetland mitigation banking at Snohomish County Airport (Ramos, 2014). Longer term ethnographic research has identified sociocultural challenges to salmon recovery among diverse stakeholders in Skagit County (Breslow,



2014a, 2014b). Ethnographic research methods have important applications to the recovery of the Puget Sound.

The cost of green infrastructure and LID is a subject of considerable concern in the literature. It often appears as a barrier to implementation but that claim is qualified by studies suggesting lower costs, especially when weighed within the context of ecosystem services. In the Puget Sound Region, there is a trend of population growth, corresponding increased pressure on ecosystem services and increased pollution, coupled with decreasing municipal budgets (Wellman et al., 2014b). Stormwater issues abound and annual stormwater management expenditures averaged about \$100 per capita per year while the economic value of benefits from avoiding damages and stressors to ecosystem services in many counties and municipalities are less explicit to local government planners and decision makers (Visitation et al., 2009). For example, some studies in the Midwest report that LID can be significantly less expensive than traditional methods of development, although it may require relatively higher amounts of maintenance (Bowman & Thompson, 2009). Likewise, green infrastructure provides valuable ecosystem services such as protection from storms (Farber et al., 2006). On a national scale municipalities are using a diverse range of strategies to fund green infrastructure practices, including the leveraging of stormwater utilities, credit incentives for commercial and individual implementation of LID technology, federal funding programs, such as the Clean Water and Drinking Water State Revolving Loan Funds (SRFs) or 319 grants for control of nonpoint source pollution, public-private partnerships, (White House Council on Environmental Quality & EPA, 2012). Differing perspectives on the cost of LID abound.

The nations of the Pacific Rim utilize Puget Sound as the major gateway for trading. Puget Sound boasts a natural wealth able to supply an assortment of ecosystem services increasingly recognized by social and natural scientists. Economists have estimated that the ecosystem services and goods provided by nature accounts for benefits worth \$9.7 billion to \$83 billion annually. These services include water, flood protection, recreation, and more and if evaluated as a capital asset their worth would be between \$305 billion and \$2.6 trillion (Batker et al., 2008, 2010). Typical accounting schemes that do not accept natural capital as an asset lead to a devaluation of these assets within human social systems. But the loss of valued species can have negative consequences economically, socially, and culturally (Batker et al., 2005; Wellman et al., 2014a). A management approach—the ecosystem services approach— integrates ecology and economics to help explain the effects of policies and impacts on functionality of ecosystems and human welfare (Farber et al., 2006). It follows that, in order to achieve an economically sustainable future, investment must be shifted away from those that damage ecosystem services towards those that recover and sustain them (Batker et al., 2008, 2010; Harrison-Cox et al., 2012). A comprehensive approach to ecosystem management considers the value of ecosystem services, but these costs may not be apparent in municipal accounting systems.

### **Methods for Investigating Barriers to Green Infrastructure**

Several social scientific studies investigate barriers to the implementation of green infrastructure. Identifying and removing or overcoming barriers is recognized as a vital step towards realizing the potential of sustainable development (Thompson, 2006). A large national survey of cities and counties in the United States found that “shortfalls in regulatory compliance are not isolated problems” and “deficiencies in enforcement and compliance can present significant barriers to effective planning and management of development” (Burby, May, & Paterson, 1998, pp. 324 & 331).

An early analysis of barriers to sustainable stormwater management represented by LID in the United States and water sensitive urban design (WSUD) in Australia drew from the authors' collective experience, that of their colleagues, and a synthesis of the literature to emphasize the importance of watershed-scale approaches and identify the following seven primary barriers: "(1) uncertainties in performance and cost, (2) insufficient engineering standards and guidelines, (3) fragmented responsibilities, (4) lack of institutional capacity, (5) lack of legislative mandate, (6) lack of funding and effective market incentives, and (7) resistance to change" (Roy et al., 2008). An article using Georgia as a case-study but drawing broadly and primarily from existing literature, identified regulatory and institutional, market, and risk aversion barriers to adoption of conservation subdivisions (Carter, 2009). Studies outlined below investigated barriers to green infrastructure using methods similar and complementary to those under consideration in the accompanying study.

U.S. Water Alliance, formerly known as Clean Water America Alliance, conducted a national survey of barriers and gateways to green infrastructure that, like Roy et al. (2008), has served as a model for several subsequent researchers (Abhold et al., 2011). Their online survey of representatives of more than 200 private, academic, non-profit, and public entities (including utilities, municipalities, state, regional, and federal government) drew from a broad national sample, but the majority of respondents came from east of the Rocky Mountains and municipal employees were lumped together with other respondents. They organized the barriers under four broad, and often overlapping, categories: technical and physical barriers, legal and regulatory barriers, financial barriers, and community and institutional barriers. Selected examples of technical and physical barriers include "lack of understanding and knowledge" of green infrastructure, "deficiency of data demonstrating benefits, costs, & performance," and "lack of design standards" (Abhold et al., 2011, p. 2). Legal and regulatory barriers include lacking, conflicting, or restrictive local rules, complications from state water and land-use policies, prescriptive and conflicting federal rules. Examples of financial barriers include insufficient data on maintenance costs and economic benefits, perceptions of high cost, insufficient funding, and too much risk relative to incentives. Community and institutional barriers include insufficient and inaccessible information, under-appreciation of green infrastructure aesthetics and characteristics, and "lack of inter-agency and community cooperation" (Abhold et al., 2011, p. 3). The summary table of results below follows, with some modifications, the general categories outlined in this national survey and includes data from additional smaller, regional, and international studies.

At the request of the EPA in 2011, the Water Environment Federation (WEF) compiled a list of barriers to implementation of green infrastructure. The WEF is a not-for-profit member association representing 36,000 water quality professionals from around the world. WEF queried its technical committees and regional and state member associations from across the country to compile a list of six barriers, listed by priority:

- Funding and Cost of Implementing Green Infrastructure
- Regulatory Impediments to Implementation of Green Infrastructure
- Acceptance of Municipal Staff, Local Leaders, and Practitioners
- Programmatic Challenges
- Maintenance Burdens
- Design and Construction Hurdles (Eger, 2011).

Additional details from WEF under these headings are included in the barriers and solutions table below.

The White House Council on Environmental Quality and the Environmental Protection Agency hosted a conference entitled “Municipal Stormwater Infrastructure: Going from Gray to Green” on September 20, 2012 to bring together “key stakeholders from the federal, state, local, and private sectors.” The participant briefing guide includes a summary of responses to four questions asked of “all non-federal attendees.” These questions asked participants to identify “the most significant barriers to the use of green infrastructure practices to manage municipal stormwater,” steps that federal agencies along with communities and others might take to promote use of green infrastructure, the most promising and effective practices, and recommended successful funding practices. The summary identified the following paraphrased barriers:

- Lack of nationally consistent performance standards.
- Need for state and municipal flexibility.
- Lack of approved stormwater manuals for green infrastructure.
- Risk of underperformance and uncertainty associated with new design standards.
- Difficult to find contractors with appropriate skills (in some parts of the country).
- Misperceptions of the cost and performance of green infrastructure.
- Lack of sufficient documentation of long-term maintenance costs.

Participants engaged in table discussion around these barriers and responses to the other questions (White House Council on Environmental Quality & EPA, 2012).

Stephen C. Allen (2011) summarized the results of an assessment of barriers to conservation subdivisions (CSD) in North Carolina. The design of CSDs conserves open space by clustering homes on a portion of land to be developed and, along with LID, is part of the larger strategies of green infrastructure. This assessment employed a mixed method approach that combined online survey responses of 246 attendees of conservation subdivision workshops with “in-person, individual, semi-scripted interviews with a member of the planning staff, a planning board member, and a developer” from four case-study municipalities that had successfully implemented CSDs (Allen, 2011, pp. 5–7). Their surveys used Likert-scales to rank barriers and they analyzed the transcribed interviews to identify common themes, including barriers to implementation. Their top barrier was “lack of incentives for developers,” followed by “perception that conservation subdivisions were more expensive to build, lack of interest from elected officials, smaller lot sizes, restrictive zoning, and concerns over long-term management of open space” (Allen, 2011, p. i). These regional barriers to CSDs show some overlap with barriers to LID and green infrastructure more generally.

Troy Bowman (2011) surveyed Midwest homeowners, developers, and civic officials and conducted focus groups with developers and municipal staff to assess familiarity with and interest in alternative designs such as CSD and LID. Barriers to CSD and LID he identified include subdivision regulations and perceived lack of demand. The survey of city officials in Bowman (2011, pp. 150–153) pre-identifies the potential barrier of development regulations and asked respondents to rate its significance on a scale of 1-5. His analysis also reveals that “limited familiarity with and knowledge about LID and CSD features across all groups present barriers that can prevent the adoption of these approaches” (Bowman, 2011, p. 94). In a related state-wide survey of Iowa developers and a local survey of residents of Cedar Rapids, Bowman and Thompson (2009, p. 105) reported that most developers believe that LID will incur greater costs for “approval time and site development” and they “do not perceive demand for alternative subdivision designs from consumers;” yet, they do not “actively pursue information about consumer preferences.” Surveys of residents, though, show “clear

interest” and “even willingness to pay for some features.” Surveys and focus groups with residents, developers, and city staff in Ames, IA also found that limited familiarity with LID and CSD “may create barriers that prevent adoptions of these approaches” (Bowman, 2011, p. 52).

Another study in the Midwest focused on the cities of Milwaukee, WI and Cleveland, OH. Keeley, et al. (2013) interviewed eight experienced green infrastructure practitioners, two of whom were from municipal governments. The others came from regional sewer districts and community development organizations. The “in-depth, semi-structured interviews (ranging from 60 to 90 min) with open-ended questions” explored challenges “in enhancing stormwater management and integrating green infrastructure strategies” (Keeley et al., 2013, p. 1097). The questions examined perspectives on three of the primary barriers identified by the Clean Water Alliance (Abhold et al., 2011): “(1) technical (issues such as aging infrastructure, degraded water quality, and inclusion of green infrastructure in planning) (2) administrative and political (such as fragmentation of responsibilities, legal challenges, or cross-border receiving water body responsibilities), and (3) financial (rate setting, billing and accounting processes, and methods for raising funds)” (Keeley et al., 2013, p. 108). In this small sample of seasoned practitioners familiarity with green infrastructure did not appear to be as strong a barrier as identified by Clean Water Alliance and the interviewees emphasized the dominance of financial barriers in these shrinking cities (Keeley et al., 2013, pp. 1104–1106). While municipal employees were an important part of the sample, they were again lumped together with other practitioners.

<b><u>Identified Barriers to LID Implementation for Stakeholders</u></b>	
<b><u>Classifications</u></b>	
<b>FL</b>	Fear of Liability
<b>RSN</b>	Reluctance to try something new
<b>LET</b>	Lack of education and training
<b>LDE</b>	Limited design example
<b>LCC</b>	Life cycle costing
<b>PP</b>	Public perception
<b>CER</b>	Compatibility with existing requirements
<b>MCE</b>	No clear economic incentives for using LID
<b>SHP</b>	Semi-arid area hydrology/poorly drained soil
<b>MD</b>	Maintenance and durability
<b>SWN</b>	Standing water nuisance
<b>FRP</b>	Fear of lengthening review process
<b>CMR</b>	Conflict with municipal code requirements
<b>ECD</b>	Expansive soils and construction defect lawsuit
<b>HGT</b>	High groundwater table
<b>OAE</b>	Other alternatives are easier

(Olorunkiya et al., 2012, p. 31)

An analysis of the relative importance of different barriers for design and construction professionals in Auckland, New Zealand established risk perception as pre-eminent but found that

accumulated experience in the profession reduced that perception (Olorunkiya et al., 2012). This two-stage study began with semi-structured interviews that included a survey asking respondents to categorize pre-identified barriers using the general categories from the Clean Water Alliance (Abhold et al., 2011). The researchers used the results of the interviews and surveys to develop an online questionnaire, distributed to 350 professionals throughout New Zealand using Survey Monkey. Of the 133 respondents, 24 came from a “regulatory authority.” A summary of the barriers identified in the survey appears in the table above (Olorunkiya et al., 2012, p. 31). While this study in New Zealand found perceived risk to be a primary barrier, accumulated experience in the profession reduced the perception of risk.

The more focused international study in New Zealand is complemented by a thick description of water and political ecology in Salvador, Brazil and Buenos Aires, Argentina. Stephanie Kane (2012a) offers the most traditionally ethnographic of the studies considered here. Based primarily upon participant observation with clean water activist communities in these large South American cities, Kane also conducted selected open-ended interviews with municipal employees. She draws attention to the way that past and current infrastructure projects constrain future alternatives and that state and corporate power reproduce socioeconomic inequality and environmental injustice. She notes commonly recognized barriers to water quality management such as fragmented jurisdictions, value of capital over nature, eco-blind engineering, lack of accountability for damage to ecosystems, and lack of legitimacy of government officials but also includes some less commonly noted ones such as international agreements that lead to increased herbicide and pesticide use, centralization of wealth, decentralization of responsibility, externalized costs, more interest in public relations than ecology, and assassination of community activists. Kane (Kane, 2012a, p. 176) proposes criminalizing environmental damage as a solution, “Whether mundane or horrifying dramatic, the harmful acts that degrade the environment should join the gallery of globally recognized vicious behavior, acts as violent and intimate as street assaults. If only we could see them that way.”

Although published nearly a decade ago, the monograph *Saving Puget Sound* (Lombard, 2006) is notable in this literature review because of its book-length treatment of barriers and solutions to conservation by a former municipal employee of King County. Lombard (2006, p. 319) presents conservation strategies for Puget Sound in the twenty-first century that would address the time and space scales of the ecoregion’s most critical areas in two crucial ways. “First, they would recognize the importance of these places across the entire ecoregion and prioritize protection and restoration accordingly. Second, they would create incentives and mechanisms for individual actions to support these priorities over time--through ‘environmental sin taxes,’ new approaches to mitigation, stormwater plans attuned to specific watersheds, compensation to landowners for ecological services, and other changes from our current approach.” Most useful for this review are his discussions of a couple dozen topics that can be understood as barriers to policy integration in municipalities in the Puget Sound region; but, like in Kane’s work, these are often framed in a broader cultural context. Selected examples include cumulative impacts of development, need for watershed level planning, too much focus on the federal level, subsidies for environmental degradation, insufficient compensation for impacts on property owners, conflicting mandates, lack of authority for watershed planning groups, uncharged impact fees, natural resources defined by commercial not ecological value, urban-rural political divide, lack of progress tracking within municipalities, opposition to power sharing, and

fragmented international and municipal boundaries. These examples and others from Lombard are included in the barriers and solutions table.

<b>Barrier Category</b>	<b>Barrier No.</b>	<b>Barrier Name</b>
<b>Keystone</b> (most influential)	7	Resistance to change
	5	Clarification of legislative mandates
<b>Prominent</b> (influential)	1	Uncertainties in performance and cost
	6	Lack of sufficient funding & market incentives
<b>Moderate</b> (least influential)	2	Insufficient engineering standards and guidelines
	4	Lack of institutional capacity
	3	Fragmented responsibilities

(Dochow, 2013, p. 58)

Dianne Dochow (2013) employed mixed methods for a case study of barriers to LID strategies in stormwater management much closer to home in Clark County, WA. She focuses primarily on Clark County as an NPDES Phase I Municipal Stormwater Permittee and compiled data from “peer-reviewed studies, government reports, government and private websites, journal articles, articles in periodicals, published fact sheets, newspaper articles, court proceedings, and professional discussions” (Dochow, 2013, p. 2). Dochow builds her framework around the seven barriers identified by Roy, et al. (2008) but divides them “into three categories according to influence on LID initiatives: Keystone, Prominent, and Moderate.” She places “resistance to change” and “clarification of legislative mandates” as keystone barriers, those most likely to influence LID initiatives (Dochow, 2013, p. 3) and notes that an important driving factor for implementation of LID might be Phase I NPDES permit compliance (Dochow, 2013, p. 61). Dochow (2013, p. 58) re-evaluates the barriers from Roy, et al. (2008) using qualitative local data and then ranks them as shown in the table above.

Abbey Stockwell (2009) employed a literature review and semi-structured interviews to analyze barriers to LID in the North Coast Redwood region of California. She employed a comparative approach, considering data from the Puget Sound region as one of four US regions. She interviewed 13 participants from the North Coast and a total of six from the four comparative regions. Her analysis lumped “government staff” with “developers” and “consultants.” The study compiled a comprehensive list of barriers to adoption, needs, and opportunities for LID implementation. Her research concludes that the most significant barriers to LID found on the North Coast were institutionalized conventional practices, budget and staff constraints, and challenging local site conditions (Stockwell, 2009). While one or two of her interviewees came from the Puget Sound region her analysis paints a broad stroke that considers municipal employees alongside other LID practitioners and has a primary focus on Northern California.

Some recent local studies have taken place in the Puget Sound region as municipalities have prepared responses to questions about LID on NPDES annual reports for the Department of Ecology in 2010. Thurston County, as part of their compliance with the NPDES Phase II Stormwater permit, reviewed code and developed technical memos identifying barriers to LID implementation within the county. Barriers identified within the report include: codes and standards (ex. Planned Rural Residential Development standards, open space requirements, prohibition of cluster subdivisions, land use, zoning and development codes, road standards, LID BMPs, etc.); court rulings and questions about the legality of ordinances that require LID principles like “65/10” as a form of tree preservation; conflict with the Growth Management Act and other competing priorities; and general institutional issues (stormwater as an afterthought, lack of incentives, etc.) (Thurston County Water Resources, 2011). The City of Kenmore has also published a table of barriers to LID on their website. Primary challenges identified include those related to codes that allow but do not require LID BMPs for site assessment, planning, and design; building design; vegetation protection; clearing and grading; and integrated management practices (City of Kenmore, 2009). While informative and included in the table below these studies are limited in scale and do not identify patterns across counties, cities and towns.

With new municipal stormwater permits requiring the use of LID, demand for training is anticipated to exceed current provider capacity. A project team made up by The Washington Stormwater Center, Veda Environmental, Cascadia Consulting Group, and the Washington State University Social and Economic Sciences Research Center came together to conduct two statewide surveys (Washington Department of Ecology, 2013). These web-based surveys were designed to facilitate an understanding of the capacity of present LID service providers to meet increased need for training. The surveys assessed the interest level of potential contributors to fill instruction gaps as well as the type and level of training necessary for stormwater professionals. The survey results, gathered from November 2012 to January 2013, informed the project team as they completed a LID Training Plan for Washington State.

The statewide LID training study concluded that regional coordination will be essential to ensure an efficient use of limited state resources and that program support is essential, particularly support with funding, marketing, and curriculum development. Issues identified as key to advancing LID in Washington State included: developing regionally relevant case studies that present costs and methods of maintenance, costs of complying with new regulations, and developing guidance on communicating LID concepts with members of the public (Washington Department of Ecology, 2013). The Assessment revealed some concerns surrounding LID. These included cost, operations and maintenance, feasibility, design standards, and designer/engineer/builder knowledge. It’s worth noting that the survey uncovered that respondents from the non-government sector reported using LID knowledge and practices on a much greater proportion of their projects than government respondents. The study’s comparison among government types also showed that Phase I governments appear to use LID on a greater proportion of projects than Phase II governments. The survey results and analysis guided policy makers to implement more introductory, mid, and advanced level curriculum development and trainings to a wide breadth of professionals including: permitters/planners, inspection/enforcement professionals, designers/engineers, elected officials/managers and real estate professionals.

The studies considered here draw from a broad base of national and international contexts as well as more regional ones from a variety of locations, including the Puget Sound region. They employ

a multitude of techniques that have included literature reviews and analysis, participant observation, online and written surveys, focus groups, mapping exercises, document analysis, and informal, semi-structured and structured interviews. Authors generally agree that more social research is needed, particularly comparative and geographically specific analyses (Dochow, 2013; Kane, 2012a; Keeley et al., 2013; Lombard, 2006; Olorunkiya et al., 2012). The barriers and solutions table below synthesizes the results of these disparate studies, noting their geographic focus. The barriers are organized around four major categories: technical and physical, legal and regulatory, financial, and community and institutional. This table forms a base set of known barriers to and solutions for green infrastructure.

## Summary

A sustainable future for humanity is dependent upon an ability to better integrate our infrastructure needs with the ecological systems within which we live and upon which we depend for our survival. On an international scale governments are recognizing this imperative and increasingly encourage and even mandate the use of new standards for development. These new standards are collectively known as green infrastructure and include a recognition that our buildings, roads, and cities need to be designed in a way to foster the continued provision of ecosystem services. In the United States the Clean Water Act, Endangered Species Act, and the Coastal Zone Management Act provide a legal and regulatory framework underlying green infrastructure initiatives. While guided by federal policy individual states and municipal governments are at the front-lines of the implementation of new green infrastructure standards.

Municipal governments, in particular, play a crucial role in the application of green infrastructure in Washington State. The Puget Sound Partnership, a state agency created in 2008, brings together key stakeholders who have produced an Action Agenda prioritizing the strategies needed for recovery of the Puget Sound. Strategic initiatives emphasize the importance of prevention of pollution from stormwater runoff, protecting habitat, and recovering shellfish beds. Through management of their own development as well as regulation of private development within their jurisdictions, municipalities are essential collaborative partners in achieving these strategic initiatives. Implementation of low-impact development (LID) design standards and the Shoreline Master Plan (SMP) process are key tools municipal governments can use to advance the Action Agenda.

Municipal governments are complex institutions whose structure, processes, behaviors, and practice may facilitate or impede achievement of priorities established in the Action Agenda. This literature review reveals a myriad of barriers to implementation of green infrastructure reported internationally, nationally, regionally, and locally. A base set of known barriers is well-established in the literature and summarized in the table below. Much of the data, though, comes from outside the Puget Sound region. Existing data sets neither distinguish between municipal employees and other professionals engaged in green infrastructure nor do they permit the identification of patterns across types of or within divisions and hierarchies of municipalities. Thus, more research is needed to establish the extent to which the known barriers apply to Puget Sound municipalities; how they vary by municipal type, size, urban and rural settings; and patterns that may exist within divisions and hierarchies of municipalities.



*Table 4.1 Literature Review Barriers and Solutions*

Barrier Category	Barrier Description	Solution	Location	Citation
Technical & Physical	Other alternatives are easier Q7.27		New Zealand	(Olorunkiya et al., 2012, p. 31)
	Cumulative effects are hard to prove Q7.25		Puget Sound	(Lombard, 2006, p. 131)
	Need for watershed-level planning Q9.18		King Co.; Puget Sound	(Bethel & Neal, 2003, p. 419; Lombard, 2006, p. 45)
	Narrowness with which organizations are defining green infrastructure Q7.37		US	(Abhold et al., 2011, p. 14)
	Project-scale ignores cumulative effects Q9.22		Puget Sound	(Bethel & Neal, 2003, pp. 402, 403; Lombard, 2006, pp. 12, 54)
	No comprehensive plans exist to coordinate stormwater management benefits of small-scale projects Q9.05		Milwaukee & Cleveland	(Keeley et al., 2013, p. 1099)
	Contractors with the skills to install green infrastructure measures can be hard to find. 7.02		US; Massachusetts; WA	(Harvard Law School, 2014, p. 18; Washington Department of Ecology, 2013, p. 16; White House Council on Environmental Quality & EPA, 2012, p. 5)
	Lack of training/demand will exceed capacity Q7.06		WA	(Washington Department of Ecology, 2013, p. 26)
	Antiquated, degraded existing gray infrastructure; need to use new, innovative technology Q7.32		Milwaukee & Cleveland; Puget Sound	(Keeley et al., 2013, p. 1099; Visitacion et al., 2009, p. 152)
	Need to prioritize projects according to improvement potential Q9.22		Puget Sound	(Visitacion et al., 2009, p. 152)
Small-scale projects preferred for urban revitalization Q7.15		Milwaukee & Cleveland	(Keeley et al., 2013, p. 1099)	

Barrier Category	Barrier Description	Solution	Location	Citation
	Large-scale GI projects are preferred for streamlining maintenance Q7.15	Elevate the issue to the policy level so alternative solutions have the level of line support needed; use high levels of citizen involvement (volunteers to plant/maintain raid gardens, prune tree, etc. Q9.17	US; Milwaukee & Cleveland	(Abhold et al., 2011, p. 18; Keeley et al., 2013, p. 1099)
	Difficult for public agencies to ensure proper maintenance is occurring on private property Q7.17	Educate communities on the need for paradigm change in maintenance; develop/publish strategies for communities on maintenance issues of green infrastructure Q9.14	US	(Abhold et al., 2011, p. 16; Eger, 2011, p. 2)
	Legal restrictions preventing use of public funds on private property Q7.12		Milwaukee & Cleveland	(Keeley et al., 2013, p. 1099)
	Appreciating the role of individual actions taken on private property to manage stormwater Q10.26		Milwaukee & Cleveland	(Keeley et al., 2013, p. 1099)
	Any circumstance in which infiltration is not desirable creates a physical barrier (e.g. steep slopes, landslide hazard areas, floodplains, etc.) Q7.01, code: steep slopes		US; New Zealand	(Abhold et al., 2011, p. 16; Olorunkiya et al., 2012, p. 31)
	Unavailability of land Q7.36	Create innovative designs, incentives for private properties to manage stormwater onsite, coordination with affected utilities to work through financial/regulatory challenges of where public utility can undertake projects Q7.12, Q10.22	US; Massachusetts; North Carolina	(Abhold et al., 2011, pp. 17, 18; Allen, 2011, p. i; Harvard Law School, 2014, p. 17)

Barrier Category	Barrier Description	Solution	Location	Citation
	Standing water nuisance Q7.01, code: high groundwater table		New Zealand	(Olorunkiya et al., 2012, p. 31)
	Eco-blind engineering Q2.27		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 130)
	Engineers distrust of plants Q7.27	Engineering, architecture, landscape architecture schools and continuing education should intensively teach green infrastructure design	US	(Abhold et al., 2011, pp. 16, 17; Roy et al., 2008, p. 355)
	Uncertainties in performance and cost Q7.25	Updated cost/ comparison studies should be completed and spread widely Q10.04	US; US & Australia; Clark Co.; Massachusetts	(Abhold et al., 2011, pp. 15, 17; Dochow, 2013, p. 58; Harvard Law School, 2014, p. 16; Roy et al., 2008, pp. 344, 355)
	Climate change increases frequency of large storm events Q7.07		Milwaukee & Cleveland	(Keeley et al., 2013, p. 1099)
	Lack of performance data in some climates/regions Q7.25	Develop guidance material to provide understanding of on-the-ground techniques to address green infrastructure challenges; develop boiler plate green infrastructure codes, ordinances, standards for regions as launching point for integration of green infrastructure Q9.01	US; New Zealand	(Abhold et al., 2011, p. 17; Eger, 2011, p. 2; Olorunkiya et al., 2012, p. 31)
	Lack of understanding about soils Q7.01		US	(Abhold et al., 2011, p. 17)
	Current development processes do not require many LID BMPs and/or may require additional	Potential incentives for use of LID Q10.22	Kenmore, WA	(City of Kenmore, 2009, p. 1)

Barrier Category	Barrier Description	Solution	Location	Citation
	engineering and review Q7.21, Q7.39			
	Unclear definitions and measures of success Q7.37		King Co.	(Bethel & Neal, 2003, p. 419)
	Knowledge of, and access to, free/low cost software to design and choose green infrastructure alternatives, and quantify benefits is limited/nonexistent Q9.22		US; Milwaukee & Cleveland	(Abhold et al., 2011, p. 15; Keeley et al., 2013, p. 1099)
	Need more guidance (e.g. manuals/design standards) Q7.08	Manuals/design standards/model ordinance should be created to include design strategies, along with fact sheets that provide guidance for the design of green infrastructure, including designing around site constraints, and advantages /disadvantages of BMPs Q10.02, Q10.07	US; WA; Thurston Co. WA	(Abhold et al., 2011, pp. 17, 18; Dochow, 2013, p. 58; Roy et al., 2008, p. 355; Thurston County Water Resources, 2011; Visitacion et al., 2009, p. 152; Washington Department of Ecology, 2013, p. 16; White House Council on Environmental Quality & EPA, 2012, p. 5)
	Paradigmatic change is needed to bring green infrastructure to the forefront of a project Q9.18	State environmental agencies should actively promote/educate about green infrastructure; green infrastructure should be included in local design manuals Q9.01, code: public education	US	(Abhold et al., 2011, pp. 17, 18; Bowman, 2011)
	Inconsistent quality with LID and nonconventional aesthetics Q7.10		US	(Abhold et al., 2011, p. 15)
Legal & Regulatory	Narrow focus on 2 benefits: stormwater management and community amenity; complicated by differing agendas Q7.26		Milwaukee & Cleveland	(Keeley et al., 2013, p. 1099)

Barrier Category	Barrier Description	Solution	Location	Citation
	We focus too much at the wrong level of government Q7.28		Puget Sound	(Lombard, 2006, p. 7)
	Lack of complete local, state, and federal design standards that account for regional differences (e.g. street width requirements, local weed ordinances, traffic safety rules, etc.) Q7.09		US; US & Australia	(Abhold et al., 2011, pp. 14, 19; Bowman, 2011, p. 95; City of Kenmore, 2009, p. 4; Roy et al., 2008, p. 344; White House Council on Environmental Quality & EPA, 2012, p. 5)
	Reducing driveway lengths/road widths/impervious areas (fire codes, road and curb standards conflict with LID techniques) Q7.16	Updated road standards may allow for LID BMP. Possibility of fire code changes are unknown at this time. Road standards allow property owner to use pervious surface on driveways. Q9.96	Kenmore, WA; Thurston Co. WA	(City of Kenmore, 2009, p. 2; Thurston County Water Resources, 2011)
	Deficiencies in enforcement and compliance Q7.11		US	(Burby et al., 1998, pp. 324 & 331)
	Our environmental laws are in denial Q7.12		Puget Sound	(Lombard, 2006, p. 9)
	Making the connection between unmanaged stormwater and environmental degradation Q7.22		Milwaukee & Cleveland	(Keeley et al., 2013, p. 1099)
	Utilize preventative measures Q10.27		Puget Sound	(Visitacion et al., 2009)
	We provide enormous economic subsidies for environmental degradation 7.22		Puget Sound	(Lombard, 2006, p. 10)
	Lack of compensation to property owners for restrictions beyond a regulatory baseline Q10.22		Puget Sound	(Lombard, 2006, p. 43)
	We need to amend state vesting laws Q7.12		Puget Sound	(Lombard, 2006, p. 45)

Barrier Category	Barrier Description	Solution	Location	Citation
	National boundaries Q9.22		Puget Sound	(Lombard, 2006, p. 65)
	Lack of legislative mandate Q7.39		US	(Roy et al., 2008, p. 344)
	Conflicting mandates (e.g. surface vs. groundwater vs. safety; Growth Management Act) Q7.12		Puget Sound; Skagit Co.; Massachusetts; New Zealand; Thurston Co. WA	(Abhold et al., 2011, pp. 19, 21; Breslow, 2014a, pp. 325, 326; Harvard Law School, 2014, p. 12; Lombard, 2006, p. 209; Olorunkiya et al., 2012, p. 31; Thurston County Water Resources, 2011)
	Court rulings against legality of ordinances that require LID principles (65/10, tree preservation, etc.) 7.12		Thurston Co. WA	(Thurston County Water Resources, 2011)
	Regulatory/enforcement community is often directed to only accept solutions to water quality problems that have a degree of success and certainty Q7.07	Permit authorities should work hand-in-hand with the enforcement community at all levels to encourage implementation of green infrastructure; offset permit requirements to reflect water quality benefits of green infrastructure; incorporate adaptive management; encourage flexibility in permits Q9.10	US	(Eger, 2011, p. 1)
	State leadership needed to clarify and integrate Q7.37	Establish flexible performance standards, greater promotion of GI in permits, TMDLs, and consent decrees; give benefits under other water and air programs based on triple bottom line, total project cost analysis Q9.08, Q10.04	US; Clark Co.	(Abhold et al., 2011, p. 21; Dochow, 2013, p. 58)

Barrier Category	Barrier Description	Solution	Location	Citation
	Growth management, private property rights, western water law Q7.17		US	(Abhold et al., 2011, p. 20)
	Runoff is needed to meet intrastate and international water compacts Q7.12		US	(Abhold et al., 2011, p. 20)
	Unwieldy municipal permitting processes Q7.21		Massachusetts; Waukesha Co.	(Göçmen, 2013; Harvard Law School, 2014, p. 13)
	Internal city permitting capacity and coordination (e.g. bypasses Public Works) code: internal communication		US	(Abhold et al., 2011, p. 20)
	Inflexible procurement codes Q10.23		Massachusetts	(Harvard Law School, 2014, p. 14)
	ESA doesn't address time and space Q7.12		Puget Sound	(Lombard, 2006, p. 317)
	CWA has no authority over land-use Q7.39		Puget Sound	(Lombard, 2006, p. 317)
	Fundamental conflicts for a federal endangered ecosystem act Q7.26		Puget Sound	(Lombard, 2006, p. 90)
	Watershed planning groups' lack of authority, funding, and inclusion Q7.28		Puget Sound	(Keeley et al., 2013, p. 1099; Lombard, 2006, p. 246)
	National government exclusion Q7.29		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 170)
	Lack of integration (e.g. between local water and public works offices) Q7.28	Integrate management across levels of government and the entire water cycle. Code: Internal Communication	US; US & New Zealand	(Abhold et al., 2011, p. 19; Roy et al., 2008, p. 355)
	Development not accountable for damage Q7.18		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 70)

Barrier Category	Barrier Description	Solution	Location	Citation	
	International trade agreements lead to increased pesticide & herbicide use Q9.22		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 90)	
	Lengthy review and approval processes Q7.21		King Co.; Puget Sound; New Zealand	(Bethel & Neal, 2003, p. 416; Olorunkiya et al., 2012, p. 31; Visitacion et al., 2009, p. 152)	
	Regulatory loopholes and permit barriers Q7.12		Puget Sound	(Puget Sound Partnership, 2013, p. 24)	
Financial	Funding and staff resources Q7.05	Address hurdles in market approaches to provide funding mechanisms (e.g. fee and rebate systems) Q9.07	US & New Zealand; Clark Co.; Puget Sound; US	(Abhold et al., 2011, p. 22; Dochow, 2013, p. 58; Puget Sound Partnership, 2013, p. 23; Roy et al., 2008, p. 355; Visitacion et al., 2009, p. 152)	
	Fear of liability Q7.07		New Zealand	(Olorunkiya et al., 2012, p. 31)	
	Expenditures for the environment largely go for the wrong things Q9.22		Puget Sound	(Lombard, 2006, p. 11)	
	Impact fees not being charged Q9.07		Puget Sound	(Lombard, 2006, p. 238)	
	It can be extremely difficult to develop, increase, and enforce stormwater fees Q9.07		US; Milwaukee & Cleveland	(Abhold et al., 2011, p. 22; Keeley et al., 2013, p. 1099)	
	Lack of research on cost-benefit analyses of green infrastructure; leads to misperception that green is more expensive Q7.25	Local municipalities should conduct a triple bottom line analysis to identify means for saving and/or funding GI as opposed to gray infrastructure Q9.08		US; North Carolina; Puget Sound	(Abhold et al., 2011, p. 24; Allen, 2011, p. i; Visitacion et al., 2009, p. 152; Washington Department of Ecology, 2013, p. 10; White House Council on Environmental Quality & EPA, 2012, p. 5)
	Insufficient economic analysis of the environmental and social	States and localities should conduct cost of service studies and fiscal		US	(Abhold et al., 2011, p. 24)



Barrier Category	Barrier Description	Solution	Location	Citation
	benefits of green infrastructure. Q7.25	impact analyses to determine how green infrastructure will affect the fiscal health and viability of the community Q10.04		
	Cost of investment in the upgrades and available financing for a municipality Q7.04		US	(Abhold et al., 2011, p. 22)
	There is no funding for the design development and testing of large scale demonstration projects Q10.05		US	(Abhold et al., 2011, p. 22)
	State Revolving Funds dedicated for GI are very limited and many states choose to use this money for energy efficiency instead Q7.04		US	(Abhold et al., 2011, p. 23)
	Lack of funding to develop state-level technical design and maintenance manuals and watershed plans that are integrated between programs Q10.07	Creation of dedicated staff crews with appropriate expertise to maintain green infrastructure across municipal offices Q7.06	US	(Abhold et al., 2011, p. 23)
	Funding from federal programs, particularly EPA water programs, is very limited. Q7.04	Additional, more creative financing options, including better integration between federal agencies to cost-share federal funds to local green infrastructure projects Q10.05	US; Milwaukee & Cleveland	(Abhold et al., 2011, pp. 23, 24; Keeley et al., 2013, p. 1099)
	Defunding of local governments and sewer districts by state governments Q7.26		Milwaukee & Cleveland	(Keeley et al., 2013, p. 1099)
	Cost uncertainty Q7.25		Massachusetts; US; WA	(Abhold et al., 2011, p. 24; Harvard Law School, 2014, p. 15; Washington Department of

Barrier Category	Barrier Description	Solution	Location	Citation
				Ecology, 2013, p. 26)
	Many developers are not the final tenants or owners, they will not reap the long term benefits of green infrastructure Q7.20		US	(Abhold et al., 2011, p. 24)
	Unwillingness to experiment with public funds on locally 'untested' technologies Q7.24		US	(Abhold et al., 2011, p. 23)
	Lack of economic incentives at the regional, state, and federal level for projects that help meet regulatory requirements and restore urban waters Q7.04, Q10.22	Institute tax incentives, utility rate reductions, and/or regulatory credits, streamlined permitting, density credits and transfer of development rights, regulatory credits, and watershed trading for green infrastructure projects Q10.22, Q10.27	US; US & Australia; North Carolina; Puget Sound; Clark Co.; Thurston Co. WA; New Zealand	(Abhold et al., 2011, pp. 23, 25; Allen, 2011, p. i; Bowman, 2011, p. 95; Dochow, 2013, p. 58; Eger, 2011, p. 1; Lombard, 2006, p. 272; Olorunkiya et al., 2012, p. 31; Roy et al., 2008, p. 344; Thurston County Water Resources, 2011; White House Council on Environmental Quality & EPA, 2012, p. 5)
	A critical mass for the use of green infrastructure is needed locally, regionally, and nationally to reduce cost of materials & engineering Q7.04		US	(Abhold et al., 2011, p. 23)
	Long-term maintenance cost of green infrastructure is not well documented Q7.25		US; North Carolina; New Zealand; WA	(Allen, 2011, p. i; Olorunkiya et al., 2012, p. 31; Washington Department of Ecology, 2013, p. 16; White House Council on Environmental Quality & EPA, 2012, p. 5)

Barrier Category	Barrier Description	Solution	Location	Citation
	Centralization of wealth Q7.35		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 90)
	Unfunded decentralization of responsibility Q7.28		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 90)
	Externalized costs Q7.04		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 175)
	Externalized costs of pollution Q9.22		US	(Abhold et al., 2011, p. 23)
	Construction change processes are time-consuming and costly Q7.04		King Co.	(Bethel & Neal, 2003, p. 417)
	Developers believe LID will incur greater costs for approval time and site development Q7.04, Q7.27		Iowa	(Bowman & Thompson, 2009, p. 105)
Community & Institutional	The urban/rural political divide Q7.24		Puget Sound	(Lombard, 2006, p. 57)
	Social hierarchies, Positionality Q7.35		Skagit Co.	(Breslow, 2014a, p. 325)
	Natural resources defined by commercial not ecological value Q7.31		Puget Sound	(Lombard, 2006, p. 216)
	Document damage in terms of loss of water quality and biota Q7.07		Puget Sound	(Visitacion et al., 2009, p. 152)
	Perceived lack of demand Q7.22		Iowa	(Bowman, 2011)
	Lack of interest from elected officials Q7.29		North Carolina	(Allen, 2011, p. i)
	Lack of acceptance stemming from lack of data on performance and local impacts to development	Study effects of GI on development patterns in communities; educate municipal leaders on	US; Milwaukee & Cleveland;	(Eger, 2011, p. 2; Keeley et al., 2013, p. 1099; Washington Department of

Barrier Category	Barrier Description	Solution	Location	Citation
	Q7.22, Q7.25	benefits of green infrastructure; provide open forum for communities considering green infrastructure; highlight case studies through information dissemination Q10.26	WA	Ecology, 2013, p. 26)
	Value of capital over nature Q7.31		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, pp. 64, 90)
	Need for enhanced public outreach, intensive monitoring, and intergovernmental coordination Q7.22, Q7.23, Q7.25	Increase Long-Term Control Plan schedules; develop training materials to illustrate successful inter-governmental coordination; encourage green infrastructure retrofit solutions when replacement/repair of grey infrastructure is needed Q9.15, Q10.16	US; Puget Sound	(Eger, 2011, p. 2; Visitacion et al., 2009, p. 152; White House Council on Environmental Quality & EPA, 2012, p. 5)
	Lack of inter-jurisdictional coordination Q7.23	Creation of a sustainability coordinator or leader in the government who is responsible for building relationships among city agencies to support green infrastructure — they can organize outreach efforts to the community and form partnerships Q10.16	US; Puget Sound: Milwaukee & Cleveland	(Abhold et al., 2011, p. 29; Keeley et al., 2013, p. 1099; Lombard, 2006, p. 221)
	So much coordination is required that gray becomes easier to implement than green Q10.19		US	(Abhold et al., 2011, p. 28)
	The large number of autonomous local governments Q7.23		King Co.	(Lombard, 2003, p. 185)

Barrier Category	Barrier Description	Solution	Location	Citation
	Fragmented jurisdictions and responsibilities Q7.28		Salvador, Brazil & Buenos Aires, Argentina; US & Australia; Milwaukee & Cleveland	(Dochow, 2013, p. 58; Kane, 2012b, p. 62; Keeley et al., 2013, p. 1099; Roy et al., 2008, p. 344)
	Collaboration: getting people from different departments and organizations together to work out barriers Q10.16		US;; Milwaukee & Cleveland	(Abhold et al., 2011, p. 29; Keeley et al., 2013, p. 1099)
	Lack of systematic inclusion of social scientists in problem identification and development of accompanying solution sets Code: Internal Communication		Puget Sound	(Lombard, 2006, p. 299)
	Lack of legal pressure Q7.39		Puget Sound	(Lombard, 2006, p. 170)
	General resistance to change Q7.22, Q7.24	Hold outreach efforts to community and other municipal/city agencies—from brown-bag lunches to quarterly meetings intra-agency communication to public hearings, community focus groups Q10.25	US; US & Australia; Clark Co.; New Zealand	(Abhold et al., 2011, pp. 28, 29; Dochow, 2013, p. 58; Olorunkiya et al., 2012, p. 31; Roy et al., 2008, p. 344)
	Lack of progress tracking within municipalities Q9.22		Puget Sound	(Lombard, 2006, p. 392)
	Lack of institutional capacity Q7.05		US & Australia	(Dochow, 2013, p. 58; Roy et al., 2008, p. 344)
	Opposing power-sharing with local interests Q7.26		Puget Sound	(Lombard, 2006, p. 84)
	Green technologies seem too risky to municipalities Q7.07	Training of municipal staff—so they understand it, support	US; Thurston Co. WA	(Abhold et al., 2011, p. 29; Thurston County Water

Barrier Category	Barrier Description	Solution	Location	Citation
		it, and are able and willing to implement and use it Q10.02		Resources, 2011; White House Council on Environmental Quality & EPA, 2012, p. 5)
	Communities considering green infrastructure are not convinced of the potential for long-term cost savings with a keen focus on maintenance as a hurdle to overcome Q7.24, Q7.25	Focus funding towards study of long-term maintenance efforts, costs and triple bottom line benefits Q9.08, Q10.04	US; New Zealand	(Abhold et al., 2011, p. 18; Eger, 2011, p. 1; Olorunkiya et al., 2012, p. 31)
	Public uncertainty about new design standards Q7.22	Every city should have at least one demonstration project; should be visible and very attractive to a wide range of residents; involve stakeholders in process—should be open and transparent Q9.21	US; US & New Zealand	(Abhold et al., 2011, p. 29; Olorunkiya et al., 2012, p. 31; Roy et al., 2008, p. 355; White House Council on Environmental Quality & EPA, 2012, p. 5)
	General unfamiliarity with green infrastructure Q7.22	All age groups in a community should be exposed to information describing what green infrastructure is, green infrastructure benefits, the detrimental effects of stormwater, and linking it to the bigger picture of watershed health code: public education	US; Massachusetts; Iowa; Thurston Co. WA	(Abhold et al., 2011, pp. 16, 29; Bowman, 2011, p. 94; Harvard Law School, 2014, p. 18; Thurston County Water Resources, 2011)
	Need to increase public awareness, education, and accountability Q7.22	Curricula should be developed for all levels of education; inform community through various media on related issues and develop coalitions to support them Q10.26, code: public education	US; Puget Sound; New Zealand; Thurston Co. WA	(Abhold et al., 2011, pp. 26, 29; Klima & Bittenob, 2009, 2010; Olorunkiya et al., 2012, p. 31; Roy et al., 2008, p. 355; Thurston County Water Resources, 2011; Visitacion et al., 2009, p. 152; Washington

Barrier Category	Barrier Description	Solution	Location	Citation
				Department of Ecology, 2013, p. 10)
	Aesthetics: one person's native plant is another person's weed Q7.10		US	(Abhold et al., 2011, p. 28)
	Only for public relations Q7.40		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 64)
	Death threats Q7.24		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 83)
	Assassination of activists Q7.24		Salvador, Brazil & Buenos Aires, Argentina	(Kane, 2012b, p. 85)
	Technical discourse that mask social factors Q7.40		Skagit Co.	(Breslow, 2014a, p. 326)
	Legitimacy Q7.40		Skagit Co.; Salvador, Brazil & Buenos Aires, Argentina	(Breslow, 2014a, p. 325; Kane, 2012b, p. 151)
	Good proposals blocked by poor political relations Q7.26		King Co.	(Lombard, 2003, p. 185)
	Differing sense of place among stakeholder groups Q7.26		Skagit Co.	(Breslow, 2014a, p. 325)

## Appendix B

### Barriers & Solutions - Participant Observation

The barriers and solutions listed below came up in everyday conversation between municipal staff, trainers, and/or participant observers. When the dialogue included a reference to a specific municipality then that community is identified by our demographic variables in the right hand columns. Items without a code in the right hand columns did not include a reference to a specific municipality.

*Table 5.1 Participant Observation Barriers and Solutions*

Barrier Category	Barrier Description	Solution	County City	Population	Urban Rural Both	Phase I Phase II Non
Technical & Physical	Structural failure of pervious pavement due to incorrect calculation of load Q7.38	Use accurate load calculations Q10.27	Ci	Mid	U	PII
	Difficulty Accessing/Sourcing Appropriate Specified Materials Q7.04					
	Maintenance required for pervious pavement Q7.03	Identify responsible party for maintenance up front Q9.12				
	Scale of residential LID too small for companies Q7.36	Group projects in a neighborhood together	Ci	Large	U	PII
	Lack of alternative access to avoid construction vehicles on pervious pavement Q7.36	Cover and protect new pavement during construction Q10.27				
	Filtration site needs protection from construction equipment Q9.18	Host pre-construction meeting with contractors Q9.18				
	Utility installation may disrupt filtration system Q9.18	Install utilities first and/or minimize road crossings Q9.18				
	Infiltration on glacial till requires special consideration Q7.01	Think of where water is going to go Q9.02				
	Construction sequencing a big challenge Q9.18	Extra attention to proper sequencing Q9.18				
	Aggregate might freeze, creating slippery surface Q7.07					
Level of maintenance unclear Q7.25						



Moss infilling Q7.03	Some engineers have observed good drainage even with moss. Q10.04				
Permeable pavement may be challenging (or not feasible on steep slopes-unknown setbacks) on slopes Q7.01	Work with geotech on appropriate fill material Q10.04				
Fine material may migrate from neighboring soils Q7.01	Use geotextile/synthetics as a vertical barrier Q9.02				
Equipment operators expect to pound subgrade Q7.27	Remind them this is an infiltration site, spend time on site with contractors Q7.06				
New and unfamiliar techniques required Q7.06	Bring supplier and installer to pre-construction and pre-bid meetings Q9.18				
Special fractured rock not available in South Puget Sound Q7.01	Better communication with suppliers				
"No one washes anything but round rock" Q7.27					
Run-on will clog pervious surfaces Q7.03	Need to consider maintenance Q7.03				
Studded tires damage porous asphalt Q7.07					
Accidental sanding of permeable pavement during winter Q7.07					
Adjacent activities (mowing, vegetation, leaf fall, etc.) may add to maintenance Q7.03	Educate homeowners about infiltration Q9.21				
Permeable concrete not good for all locations Q7.01	Do not use in areas with heavy leaf fall or vehicular traffic: better manuals Q9.02, Q10.07				
Allowing run-on might be better for infiltration in the ecosystem, but individual projects would need to take on additional maintenance and liability to consider hydrological needs at a watershed rather than project level. Q7.38, Q7.03					
Contractors pushing back on use of 6% binder, noting that it is sticking to trucks, shoes, & rakes. Q7.07,	6% binder is a critical performance issue, "industry is going to have to come to terms."	Co	Large	B	PI

Q7.27	Engineer from large urban county says they accepted 5.8% for a private driveway. Q10.02					
Sand between permeable pavers will plug and clog after a season or two. Q7.03	Use larger fractured rock. Q9.02					
Product substitutions by engineers lead to clogging. Q7.06	Clogging tends to be in upper layers, vacuum it out. Do not approve a substitution of sand. Q9.02					
Sand may be tracked onto permeable pavement from nearby beach Q7.03	Locate permeable pavement elsewhere on project Q9.02	Co	Large	B	PI	
Leaf fall may clog permeable pavement Q7.03	Locate permeable pavement elsewhere on project Q9.02	Co	Large	B	PI	
Construction folks accustomed to pounding into pavement Q7.06	Engineers and inspectors well trained must work on site at all times Q10.02					
We're attempting to implement a process that we're still trying to understand Q7.06						
Uncertainties about bioretention soil mix for water quality treatment - we are attempting to replicate a dynamic biological system with complex structure and processes for removal of contaminants Q7.38, Q7.25	Evaluate effectiveness of pilot projects; stay abreast of research on bioretention soil mix Q10.04					
Currently deploying water quality treatment devices that are exporting contaminants Q7.07	Test new materials before using them Q10.04					
Difficult to get stability for human infrastructure on some shorelines, i.e. spits Q7.01		Co	Small	R	N	
Infiltration on bluffs requires special consideration Q7.01	Direct flows laterally and away from slopes Q9.02	Co	Small	R	N	
Significant amounts of beach gravel historically harvested for roads and other construction Q8.17	Re-nourishing them may be required Q9.02	Co	Small	R	N	

Building replacement too slow to meet challenge of climate change Q8.17	Put a price on carbon; incentives for retrofits Q9.15				
Existing infrastructure not built green Q7.32					
Legacy development from before stormwater controls were put in limits options Q7.32, Q7.36		Co	Large	B	PI
Some green infrastructure retrofits require cooperation of external entities like railroad company Q7.24		Co	Large	B	PI
Curing time for porous pavement and pervious concrete is long and is a barrier especially for private residential Q7.24					
High failure rate of porous asphalt Q7.38	New specs require stronger asphalt Q10.07				
Bioretention not suitable in some locations Q7.01	Be selective about where it is located Q9.02	Ci	Large	B	PI
Utility installation may disrupt filtration system Q7.38	Utility can replace pervious with pervious Q9.02	Ci	Large	B	PI
Vocabulary inconsistent and ever-changing (ex. Shoulder ballast is now permeable ballast; pervious/porous) Q7.38	Standardize vocabulary Q9.02				
Maintenance concerns: used to detention ponds, want to mow, don't want to weed and prune, uncertain about plants Q7.37	Train young people for technician /maintenance jobs Q10.14	Ci	Large	B	PI
Good design can be undermined by poor installation "Product is not the problem, the installation/system is what the problem is" Q7.06, Q7.38	Test installation and site checks Q9.04				
Inspectors may not know what they're inspecting Q7.06	Training Q10.14				
Preferable and less expensive plant palette (sedums) not available in winter Q8.17					

Legal & Regulatory	Access to green roofs needed for maintenance Q7.17	Sit on roof with maintenance to discuss access needs Q10.14				
	Significant maintenance required for green roof; homeowners don't want to read 20 page Operations & Maintenance manual Q7.03, Q7.13					
	No sufficient space for installation (ex. Competing space for utilities) Q7.36					
	Resilience Concerns: rapid urban growth, constrained resources, climate impacts, unknown disruptions Q7.36, Q7.38, Q8.17	Develop plan to prepare for the unknown (Code: R emergency response strategy)				
	Natural Yard Care requires more metrics, standardization Q7.08					
	Shortened construction window because of drinking water filtration Q8.17		Ci	Large	U	PII
	Extra depth may impact cultural resources and increase cost Q7.38					
	If you put bioswales in front of homes, where do you put fire hydrants? They cannot be installed in bioswales. Q7.16		Ci	Large	U	PII
	Enforcing 2012 LID Manual might put a slope with a history of slides at risk. Q7.38	Get water away from slope. Do not infiltrate. Q9.02				
	Lack of regulatory document is "a huge barrier for developers." Q7.08, Q7.12	Identify regulatory documents that would facilitate adoption. Q9.19	Ci	Large	U	PII
	Requiring something extra could be a barrier. (Code: R mandatory LID)	Need standard specs. Develop, share, or borrow regional specs. Q10.07, Q10.16	Ci	Large	U	PI
	Continuous curbing requirement around full parking lots. Q7.12	Allow curb cuts for infiltration. Q9.19	Ci	Large	U	PI
Not enough to allow LID in code. Q7.39	Provide examples in allowed listings, e.g. vegetative landscape. Provide supportive language, firetruck lane	Ci	Large	U	PI	

	could be permeable pavement. Q9.19					
Historic preservation code. Q7.12	Review and update. Q9.19	Ci	Large	U	PI	
Grading code. Q7.12	Review and update. Q9.12	Ci	Large	U	PI	
Client assisted memos, permit review bulletins, process flow charts, and public permit information may not permit or encourage LID. Q7.21	Review and update. Q9.12	Ci	Large	U	PI	
LID code update toolkit forms. Q7.08	Use forms, but add code # and responsible party. Use review form as a reporting instrument for large codes (inefficient for small). Q9.19	Ci	Large	U	PI	
Parks code. Q7.12	Review and update. Q9.12	Ci	Large	U	PI	
Code update is lengthy process. Q7.12	Start early, be flexible, use checklists, enlist help of upper management. Integrate with Growth Management Act or Comprehensive Plan updates. Remember that changes must be effective, not just adopted. Brief council early about proposed changes. Q9.12, Q7.34	Ci	Large	U	PI	
Design manual needs update. Q7.08 "Manual not up to speed with new learnings"	Overhaul entire design manual in process; borrow from other municipalities; standardize manual and technical specifications Q10.07, Q10.16	Ci	Large	U	PI	
Length of review and update process for codes takes so long you may experience attrition. Q7.21	Stay in touch with team throughout process. Q9.13	Ci	Large	U	PI	
Variance may be required for permeable sidewalk. Q7.12	Allow permeable concrete sidewalks so variance is not needed. Q9.19	Ci	Large	U	PI	
Americans with Disabilities Act conflicts. Q7.16	Review and update. Q9.19	Ci	Large	U	PI	
Staff unfamiliar with new changes to code. Q7.06	Send staff to LID statewide trainings. Q10.02	Ci	Large	U	PI	

Codes may be shared between departments, e.g. land use and stormwater. Q7.12	Decouple major codes so review by others does not hold up full process. Give heads up to other departments that revisions are coming. Q9.21, Q10.12	Ci	Large	U	PI
Higher costs of LID compliance is causing development to disperse into neighboring non-permitted areas Q7.14	Require LID in non-permitted areas; educate people Q9.21, Q10.12	Ci	Med	U	PII
LID not required in non-NPDES permitted areas Q7.39					
LID manual is "kinda messy right now" with "things that contradict, things that don't make sense" Q7.08	Patience, change may take a while (CODE: P TIME)				
Public buildings (defined as 2+ families) must be connected to public water; not allowed to treat on-site water to potable Q7.12	Get an exemption (need \$ and influence) Q10.27	Ci	Large	U	PI
Waterways overlap jurisdictions (one manages a ditch for water quality and the other for flood control) Q7.23	Coordination Q10.16	Ci	Medium	U	PII
Must show hardship to harvest rainwater Q7.12	Rainwater should be regulated separately than surface water Q9.19	Co	Large	B	PI
Annual Report to DOE is all yes/no: Doesn't allow room for explanation (Code: R Check the box)					
"Regulation responds to what already exists" Q7.12					
Deep Energy Retrofits don't work because of split incentives and utility economics, utility is against energy because of LOST SALES Q8.17	Renewable energy credits Q10.22				
	Free Consultation assistance through SPU and Seattle City Light Q10.16				
"where feasible" is too vague regulations are vague Q7.37					

Financial	"I'm tasked with running and leading the ordinance review committee, but we haven't had a meeting yet" Q7.05		Co	Large	B	PII
		Increase staff time for code update Q9.19, Q10.06				
		Rebates and incentives for green building development Q10.22				
	Extra depth may impact cultural resources and increase cost					
	Maintenance costs on bioretention "really high" Q7.04					
	Need funding for updates to specs, not yet in LID manuals. Q7.04, Q7.08	Interim update, but even that costs money. Q9.19				
	From an engineer with a large city: LID was presented as the next best thing, cheaper to build and maintain. "This is BS!" LID came from Surface Water people who didn't understand how streets work. Q7.27		Ci	Large	U	PII
	The greenest design is often the most expensive Q7.04	At this meeting the community strongly favored the greenest option Q10.27	Co	Large	B	PI
		Going green is increasingly being seen as a way to reduce costs Q10.04	Co	Large	B	PI
	Challenge for private developers to get customers to pay more Q7.04					
	Speculative development makes it difficult to incorporate green design because savings is over long-term Q7.20					
	Green businesses need more support from municipal governments Q8.17	Incentivize scalable pilot projects; create scorecard of sustainability metrics for contractors Q10.18, Q10.22	Ci	Large	U	PI

Community & Institutional	Low income communities felt disproportionate impact of budget cuts in aftermath of 2008. Q7.35					
	People cannot afford to live where they work Q8.17					
	Every purchase has hidden impacts - human, social, environmental Q8.17	Use green standards and certifications, life-cycle cost assessments, and weighted evaluation criteria in purchasing decisions; include green design standards in specs Q10.03&Q10.04&Q10.18				
	Green roof cost 7-8 times that of a conventional one. Q7.04		Ci	Medium	U	PII
	Rebate incentives treated as income by IRS; discouraging low-income homeowners who may lose eligibility for housing, health, and/or welfare Q7.35		Ci	Large	U	PI
	Rebate incentives require upfront expenditure that low-income households may not have Q7.04	Create revolving loan funds Q10.22	Ci	Large	U	PI
	Incentives may not cover full cost; low-income households may not be able to participate Q7.04		Ci	Large	U	PI
	Decision-makers have conflicting values, priorities, and constraints Q7.26	Bring science into the process through natural capital valuation, available through open source software Q9.08				
	"As a designer, you don't have the purse strings" Q7.28	Need to quantify socio-economic impacts and use triple bottom line accounting Q9.08				
	No money to update manual Q7.04, Q7.12					
	Community complaints about aesthetics Q7.10	High quality demonstration projects Q9.21				
	Residential projects require homeowner maintenance	Educate homeowners about infiltration Q9.11,				



Q7.17	Q9.21				
Studded tires damage porous asphalt Q7.07					
Some bicyclists complain about coarseness of permeable pavement Q7.24					
Parents of bicyclists concerned about more scrapes from falls Q7.24					
Public demands maintenance (pruning and weeding) of bioswales. Q7.10, Q7.03	"Adopt a bioswale program" Q10.27				
Not enough parking already, people will use the space they find. Q7.26&Q7.36&Q7.22		Co	Large	B	PI
Substantial internal resistance to code updates from municipal staff. Q7.27	Empower "cat herder" to do much of the initial work, only ask resistant staff to review changes. Q10.27				
Internal resistance comes from not understanding. Q7.27&Q7.06 "People have different understandings of LID"	Use Ecology's website resources to clear up misunderstandings. Q10.02	Ci	Large	U	PI
Staff think we're going to require everyone to harvest rainwater. (Q7.06)	Use Ecology's website resources, trainings, & field trips to clear up misunderstandings. Q10.14	Co	Large	B	PI
Project specific planning - fragmented responsibilities prevented Parks Department from addressing surface water problems upstream Q7.28		Co	Large	B	PI
Community calls for a consideration of the long-term, especially climate change and sea-level rise Q8.17	Incorporate natural capital and ecosystem services into economic modeling Q9.08	Co	Small	R	N
70% of shorelines throughout Puget Sound are privately owned Q7.17	Government, non-profits, and private landowners need to work together; offer free engineering design services and permitting assistance for projects with approved	Co	Large	B	PI

	design Q10.16				
Resistance to change. Older generation especially resistant Q7.27	Delight public with predictable, nice, complementary transportation systems; require transparency across environmental indicators in local government (i.e. reporting on impacts) 'Show and tell', Education is key! Q10.27				
Only a small percentage of funding for the environment goes to diverse communities	Change funding priorities Q10.27				
Many municipal employees not engaged with or valuing sustainability projects Q7.27	Bring committee together for decision making that includes newer employees with better understanding of sustainability issues Q9.13				
Amount of collaboration needed is immense Q7.23		Co	Large	B	PI
County is resisting adoption of 2012 Stormwater Management Manual Q7.27	Citizens insist that the County stop fighting the implementation of the manual and adopt it Q10.07, Q10.27				
Some municipal departments embrace LID while others do not Q7.27					
Asphalt industry resistant to permeability Q7.27	Concrete industry is embracing it Q10.27				
"One bad project negates a 1,000 good ones" Q7.07		Ci	Large	U	PII
Homeowner Association longevity and organizational challenges are a barrier Q7.30		Ci	Large	U	PII
No list of approved/recommended contractors is available Q8.17	Create a list of approved/recommended contractors Q10.27	Co	Small	R	N
Community-scale rainwater harvest required HOA Q8.17		Ci	Large	U	PI

Ethnically and culturally diverse communities Q8.17	Culturally sensitive approach will get better results Q10.18	Ci	Large	U	PI
Private landowner participation is necessary for retrofits Q7.17		Ci	Large	U	PI
Dispersed ownership make large projects more challenging Q7.13					
Personality types within municipality networks make collaboration difficult (Code Internal Communication)					
	"It's just the right thing to do" Cater to motivations- values- legacy- public recognition Q9.11				
Movement slow in municipal government, grant signatures, permitting signatures, etc Q7.21	Extra time to overcome resistance, receptive to comment and critique (Code: Time)				
LID manuals and Trainings conflict on a lot of specs and recommendations Q7.12		Ci	Med	U	PII
Operations staff and engineering staff has poor communication (ex. Porous concrete is laid down, operations sands new pavement) (CODE: Internal Communication)		Ci	Med	U	PII
No resources (time, money, specialization) for LID planning and design, so it is contracted out. Q8.17					
Not everyone excited about NPDES compliance Q7.27					
Nothing should to council - "Council doesn't understand and prioritizes agricultural practices that are typically counterproductive" Q7.27& CODE: Internal Communication					

## Appendix C

### Questions for Semi-Structured Interviews

#### Green Infrastructure Policy Integration in Puget Sound Municipalities

##### 1. Municipality Characteristics

- a. Interviewer circle all that apply and summarize for recording: urban, rural, county, city, large, mid-sized, small, Phase I, Phase II, non-permittee.

##### 2. Interviewee Role

- a. Would you consider your role to be executive staff, middle management, or line staff?
- b. How would you describe the division within the municipality in which you work? (e.g. planning, permitting, public works, natural resources, etc.)

##### 3. Green Infrastructure

- a. How would you define green infrastructure?
- b. How would you describe your involvement with green infrastructure? Your municipality?
- c. What challenges does your municipality face in the implementation of green infrastructure for new development?
- d. What challenges does your municipality face in the implementation of green infrastructure for your own operations?
- e. Are there specific challenges for low impact development (LID)?
- f. Are there specific challenge for Shoreline Master Program?
- g. What internal changes might help remove barriers to the use of green infrastructure in Puget Sound recovery?
- h. What external support might help remove barriers to the use of green infrastructure in Puget Sound recovery?

##### 4. Organizational Network Map

- a. We would like to create a map of operations and divisions within your municipality. Please draw the primary divisions represented in your municipality.
- b. After drawing is complete. Can you please indicate with codes on the map where stormwater management (SW), endangered species (ES), habitat (HA), water quality (WQ), low impact development (LID), and Shoreline Master Program (SMP) are located?
- c. From your perspective, map the effectiveness of relationships and communication between your department and the others on your map. Use green to indicate effective, red to indicate ineffective, and yellow to indicate mixed.
- d. Are the challenges to implementing LID and SMP concentrated in any particular division(s) in your municipality? If so, please indicate on the map where barriers are concentrated.

##### 5. Depth Questions

- a. What would a comprehensive approach to Puget Sound recovery look like?

- b. How does your municipality compare and contrast to a comprehensive approach?
- c. What should municipalities be doing beyond the minimum requirements of regulatory compliance?
- d. What is your municipality doing beyond minimum requirements?
- e. In what ways does your municipality collaborate with other municipalities on these issues?
- f. Is there anything else that you think we should know about green infrastructure at your municipality?

6. Snowball Questions – After recorder is turned off

- a. Who else would you recommend we interview at your municipality? Why?
- b. Who would you recommend from other municipalities? Why?
- c. What would be the best way for us to distribute a follow-up survey to reach a broad spectrum of staff at your municipality? And beyond?

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Thank you for your time and willingness to share during this interview. The final report will be available online via the LEAF School website, [www.edcc.edu/leaf](http://www.edcc.edu/leaf).

## Appendix D

### Consent Form for Interviews

Green Infrastructure Policy Integration in Puget Sound Municipalities

The Puget Sound Partnership (PSP) and Edmonds Community College (Edmonds CC) are interested in your knowledge of barriers to implementation of green infrastructure in your municipality. The purpose of this research is to identify patterns of barriers across local governments in the Puget Sound region along with internal changes and external support that might help advance green infrastructure as a strategy for Puget Sound recovery.

The final report from this research will be publicly available on the Learn and Serve Environmental Anthropology Field School website ([www.edcc.edu/leaf](http://www.edcc.edu/leaf)). If you have any questions or would like a copy of this consent letter, please contact: Dr. Thomas Murphy at 425-640-1076 or [tmurphy@email.edcc.edu](mailto:tmurphy@email.edcc.edu).

**Thank you for your contribution to this important research!**

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By signing below you agree to allow the researchers to record and transcribe an interview and to use that information in preparing a report for Puget Sound Partnership and for publication in peer-reviewed journals. Your participation in this study is voluntary. You may choose whether or not to answer any of the questions and may cease your participation in the study at any time.

Please be forthright in your responses. Your responses will be confidential and anonymous. PSP staff will not see identifying information related to your responses. Edmonds CC staff will take appropriate measures to ensure the confidentiality of participants. These include removing statements that might identify you or your employer from transcripts and destruction of the original audio after completion of the analysis, no later than Sept. 30, 2015.

By signing this form, you are indicating that you have **read the description of the study above**, are **over the age of 18**, and that you **agree to the terms** described above.

1. I agree to participate in a research study. I understand the purpose and nature of this study and I am participating voluntarily. I understand that I can withdraw from the study at any time, without any penalty or consequences.
2. I grant permission for the data generated from this interview to be used in publications on this topic by the researchers and Puget Sound Partnership.
3. I grant permission for the interview session to be recorded, transcribed, and the recording saved (up until Sept. 30, 2015) for purpose of review by the Edmonds CC research team.

**Name:** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date** \_\_\_\_\_

## Appendix E

### Interview Data Codes

Table 6.1 Interview Data Codes

Barrier Category	Code	Survey Question
Technical & Physical	<b>Barrier</b>	
	P high groundwater table	Q7.01 soil suitability for infiltration
	PR setback requirements	Q7.01 soil suitability for infiltration
	P soil suitability	Q7.01 soil suitability for infiltration
	P steep slopes	Q7.01 soil suitability for infiltration
	P high maintenance	Q7.03 maintenance and durability
	P small and spread out	Q7.15 projects too small and dispersed
	P no code legacy infrastructure	Q7.32 Legacy infrastructure that does not comply with present standards
	P "built out," space	Q7.36 Lack of available space
	P "not cookie cutter"	NOT IN SURVEY
	P weather patterns	NOT IN SURVEY
	<b>Solution</b>	
	P evaluate site by site	Q9.02 Using LID designs that do not require infiltration on unsuitable soils
	P other technique	Q9.02 Using LID designs that do not require infiltration on unsuitable soils
	P mapping suitability test	Q9.03 Maps showing soil suitability for various LID techniques
	P monitor LID performance	Q10.04 Lifetime maintenance cost and performance analyses
Legal & Regulatory	<b>Barrier</b>	
	R need design/manuals	Q7.08 need more guidance (e.g. manuals and design sta
	R lack local flexibility	Q7.09 guidance available is not relevant to this municip
	R code enforcement	Q7.11 insufficient enforcement of existing codes and reg
	R conflicting codes/reg	Q7.12 conflicting mandates, codes, and regulations
	R development flight	Q7.14 new development is moving to neighboring jurisdic
	R fire/ADA conflict	Q7.16 access for fire, safety, disability, solid waste etc.
	RI lack accountability	Q7.18 developers not held accountable for environmental damage
	RI permitting process	Q7.21 Longer processes for permitting
	RF lack credits/incentives	Q7.35 Unequal ability of some social groups to access incentives
	R unequal access incentives	Q7.35 Unequal ability of some social groups to access incentives

Financial	R ecology model	Q7.37 Unclear definitions of LID and "where feasible"
	R lack definition	Q7.37 Unclear definitions of LID and "where feasible"
	R not mandatory	Q7.39 Insufficient mandate for LID
	R mandatory LID	NOT IN SURVEY
	<b>Solution</b>	
	R local design standards/manuals	Q9.01 local manuals and design standards
	R group small projects	Q9.05 Grouping small projects within neighborhood clusters
	R consensus w fire dept	Q9.06 Engaging stakeholders from fire, safety, disability, solid waste, etc. in code revisions
	R permit processing time	Q9.10 Expedited permits as an incentive
	RF retrofit incentives	Q9.15 Incentives for retrofits of existing infrastructure
	RF hard armor incentives	Q9.16 Incentives for removal of hard armoring on shorelines
	R sw outset of project	Q9.18 Consider stormwater design at outset of a project
	R rewrite codes/reg	Q9.19 Limit and/or require mitigation for impervious surfaces
	R tighter regulations	Q10.01 Tighter regulations requiring green infrastructure
	R more design standards/manuals	Q10.07 Improved manuals and design standards
	R more enforcement	Q10.08 Assistance with code and regulation enforcement
	R rewrite codes/reg	Q10.09 Assistance with rewriting codes and regulations
	R revise ecology credit calc	Q10.10 Revise Department of Ecology's LID credit calculation for a more comprehensive approach to hydrology
	R definition LID/where feasible	Q10.11 Clearer definition of LID and "where feasible"
	R mandatory LID	Q10.12 Require LID in all jurisdictions (including those without stormwater permits)
	R more accountability	Q10.13 Holding developers accountable for environmental damage
	R up B for traditional infra	Q10.19 Making it more difficult to build using traditional (grey) infrastructure
	R streamline review process	Q10.21 Streamline review process among state and federal agencies
	R +regulatory flexibility	Q10.23 More regulatory flexibility when green infrastructure would meet the spirit but not the letter of the law
	R +agricultural BMPs	Q10.24 Develop best practices for LID in agricultural settings
	<b>Barrier</b>	



Community & Institutional	F project cost	Q7.04 project cost
	F risk/liability	Q7.07 risk liability
	F insufficient fees	Q7.19 Insufficient impact fees
	F cost benefits long-term	Q7.20 Initial costs are short-term, while economic benefits are long-term
	F lack data cost/maint req	Q7.25 Uncertainties in performance and cost
	FI lack green economics	Q7.31 Natural resources defined by commercial not ecological value
	F risk/liability	Q7.38 Spill and pollution prevention
	<b>Solution</b>	
	F increase impact fees	Q9.07 Increasing impact fees
	F green economics	Q9.08 Economic analyses that include ecological value of natural resources
	F increase impact fees	Q9.20 Charge stormwater fees based upon amount of discharge
	FP cost and performance analysis	Q10.04 Lifetime maintenance cost and performance analyses
	F grants for GI	Q10.05 Grants for green infrastructure
	FI grants for staff	Q10.06 Grants for increasing staff
	F local control funding	Q10.20 Allow Local Integrating Organizations (LIOs) more control of funding resources
	FR more financial incentives	Q10.22 Guidance on effective use of incentives, including non-financial options
	<b>Barrier</b>	
	I lack skilled contractor	Q7.02 availability of contractors with appropriate skills
	I insufficient staff time	Q7.05 insufficient staff
	I need more staff training	Q7.06 staff need more training
	I aesthetics	Q7.10 aesthetics
	I ownership/responsibility	Q7.13 spending public money on private property
	I private property	Q7.17 property rights concerns
	I public demand	Q7.22 Lack of public demand
	I inter-jurisdiction coord.	Q7.23 Coordination with other jurisdictions
	I external resistance	Q7.24 Public resistance
	I conflicting priorities	Q7.26 Conflicting priorities across municipal divisions
	I internal resistance	Q7.27 Municipal staff resistant to change
I fragmented staff responsibilities	Q7.28 Fragmented jurisdictions and responsibilities	
I elected officials	Q7.29 Intervention by elected officials	
I ownership/responsibility	Q7.30 Difficult for public agencies to ensure proper maintenance is occurring on private property	

I public understand shoreline	Q7.33 Lack of public understanding of shoreline processes
I upper management	Q7.34 Management vision and priorities
I social groups lack incentives	Q7.35 Unequal ability of some social groups to access incentives
I internal communication	NOT IN (BARRIER PORTION) SURVEY
I need demo projects	NOT IN (BARRIER PORTION) SURVEY
<b>Solution</b>	
I more inspections	Q9.04 More frequent inspections of stormwater facilities
IR strategic mitigation	Q9.09 More strategic mitigation (i.e. banking, in lieu fees, etc.)
I public behavior change	Q9.11 Local education and behavior change efforts
I reorganize responsibilities	Q9.12 Reorganization of structural divisions and functions within your municipality
I internal communication	Q9.13 Bring engineers, permitting, planning, natural resource, and maintenance staff together to address communication challenges
I private property mgmt. training	Q9.14 Maintenance training for private property holders
I upper municipal management	Q9.17 Stronger support for green infrastructure from upper management
I public education	Q9.21 Demonstration projects
I more staff training	Q10.02 More green infrastructure training for municipal staff
I GI certification	Q10.03 Green infrastructure certification programs
I more staff training	Q10.14 Training for conducting in-house economic analyses that include ecological value of natural resources
IR watershed level planning	Q10.15 Support for watershed level planning
I inter-jurisdictional collaboration	Q10.16 Support for inter-jurisdictional collaboration
IR decrease political power	Q10.17 Making political intervention in established processes more difficult
I social marketing	Q10.18 Identification of important social factors in adoption of green infrastructure
I public behavior change	Q10.25 Region-wide education and behavior change efforts
I social marketing	Q10.26 Dissemination of green infrastructure success stories

## Appendix F

### Survey

Welcome to My Survey

Thank you for participating in our survey. Your feedback is important.

Green Infrastructure Policy Integration in Puget Sound Municipalities

Municipal employees\* have practical experience and valuable insights for the implementation of green infrastructure policy in local communities. The Puget Sound Partnership and Edmonds Community College are gathering this local knowledge to assist municipal governments in efforts towards making the Puget Sound region a healthier and safer place to live.

The Environmental Protection Agency defines green infrastructure as using, "vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of city or county, green infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water."

Please share your expertise and experience by completing this 15 minute survey.

By proceeding to the survey you agree to allow the researchers to collect and analyze your responses in aggregate form for use in preparing a report for Puget Sound Partnership and for publication in peer-reviewed journals. Please be forthright in your responses. Your responses will be confidential and anonymous and will be shared only in their aggregate form. Your participation in this study is voluntary. You may choose whether or not to answer any of the questions and may cease your participation in the study at any time.

The final report from this research will be publicly available from a link on the Learn and Serve Environmental Anthropology Field (LEAF) School website ([www.edcc.edu/leaf](http://www.edcc.edu/leaf)) by the end of the calendar year, 2015. If you have any questions please contact: Dr. Thomas Murphy at 425-640-1076 or [tmurphy@email.edcc.edu](mailto:tmurphy@email.edcc.edu).

*Please respond as soon as possible but no later than Friday, June 23th.*

Thank you for your contribution to this important research!

*\* Municipal employees are our target audience but if you are a contracted consultant operating in a similar capacity to municipal employees, we want your perspective as well. Please identify yourself as Other and specify contracted consultant or something similar in answer to question #11.*

Municipality Characteristics

This page requests general information about your municipality that will enable researchers to draw comparisons and contrasts across different types of municipalities.

1. Which of the following best describes the municipality where you work?

- City
- County
- Other (please specify)

2. Which of the following best describes your municipal jurisdiction?

- Urban (including suburban)
- Rural
- Both urban and rural

3. Which of the following best describes the population of your municipality?

- Very large (greater than 100,000)
- Large (greater than 25,000 but less than 100,000)
- Mid-sized (greater than 2,500 but less than 25,000)
- Small (less than 2,500)
- Unknown

4. Which of the following best describes your municipality's current relationship to the NPDES stormwater program?

- Phase 1 Permittee
- Phase 2 Permittee
- Not an NPDES permittee
- Unknown

5. Within which of WA Department of Ecology's regions is your municipality located?

- Northwest (Whatcom, San Juan, Island, Skagit, Snohomish, or King Counties)
- Southwest (Clallam, Jefferson, Kitsap, Mason, Thurston, or Pierce Counties)
- Other (please specify)

## Green Infrastructure Successes

**This page identifies the experience and success of your municipality with green infrastructure.**

6. Which of the following examples of green infrastructure policy and/or projects has your community successfully implemented? Check all that apply.

- Habitat restoration
- Critical Areas Ordinances
- Updated codes and regulations to allow Low Impact Development (LID)
- Pervious pavement
- Wildlife corridors
- Shoreline Master Program
- Endangered species recovery plan(s)
- Green roof(s)
- Rain gardens and/or bioinfiltration
- Community garden(s)
- Green certifications (LEED, Built Green, Energy Star, Green Roads, CESCL, etc.)
- Cluster development
- Tree preservation
- Environmental education
- Social marketing and/or public behavior change campaign(s)
- Curb-side composting
- Curb-side recycling
- Roundabout(s)
- Narrow and/or curbless roads
- Economic analyses that include ecological value of natural resources
- Soft shoreline protection
- Bike paths and lanes
- Demonstration project(s)
- Flood plain restoration
- Other (please specify)

### Barriers to Green Infrastructure Implementation

**This page asks you to rate the relative frequency of known barriers to green infrastructure as they might apply to your municipality.**

7. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.

	Not a barrier	Infrequent barrier	Common barrier	Persistent barrier	Unknown
Soil suitability for infiltration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintenance and durability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Project cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk/Liability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Need more or improved guidance (e.g. manuals and design standards)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guidance available is not relevant to this municipality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient enforcement of existing codes and regulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conflicting mandates, codes, and regulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Restrictions on spending public money on private property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
New development is moving to neighboring jurisdictions where LID is not required	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Projects too small and dispersed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access for fire, safety, disability, solid waste, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Developers not held accountable for environmental damage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient impact fees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Initial costs are short-term, while economic benefits are long-term	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Longer processes for permitting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uncertainties in performance and cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Natural resources defined by commercial not ecological value	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Not a barrier	Infrequent barrier	Common barrier	Persistent barrier	Unknown
Legacy infrastructure that does not comply with present standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of available space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unclear definitions of LID and "where feasible"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spill and pollution prevention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient mandate for LID	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

**Institutional and Community Barriers**

**This page asks you to rate the relative frequency of known barriers to green infrastructure as they might apply to your municipality.**

8. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.

	Not a barrier	Infrequent barrier	Common barrier	Persistent barrier	Unknown
Availability of contractors with appropriate skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient municipal staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staff need more training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aesthetics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Property rights concerns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of public demand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coordination with other jurisdictions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public resistance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conflicting priorities across municipal divisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Municipal staff resistant to change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fragmented jurisdictions and responsibilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Intervention by elected officials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficult for public agencies to ensure proper maintenance is occurring on private property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of public understanding of shoreline processes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Management vision and priorities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unequal ability of some social groups to access incentives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

Potential Solutions



**This page asks you to rate the relative value of possible solutions to these barriers as they might apply to your municipality.**

9. Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.

	Not a solution	Somewhat helpful	Generally helpful	Very helpful	Unknown
Localized manuals and design standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using LID designs that do not require infiltration on unsuitable soils	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maps showing soil suitability for various LID techniques	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More frequent inspections of stormwater facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grouping small projects within neighborhood clusters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engaging stakeholders from fire, safety, disability, solid waste, etc. in code revisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increasing impact fees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Economic analyses that include ecological value of natural resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More strategic mitigation (i.e. banking, in lieu fees, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Expedited permits as an incentive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local education and behavior change efforts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reorganization of structural divisions and functions within your municipality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bring engineers, permitting, planning, natural resource, and maintenance staff together to address communication challenges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Not a solution	Somewhat helpful	Generally helpful	Very helpful	Unknown
Maintenance training for private property holders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incentives for retrofits of existing infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incentives for removal of hard armoring on shorelines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stronger support for green infrastructure from upper management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consider stormwater design at outset of a project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limit and/or require mitigation for impervious surfaces	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Charge stormwater fees based upon amount of discharge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Demonstration projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

10. Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.

	Not a solution	Somewhat helpful	Generally helpful	Very helpful	Unknown
Tighter regulations requiring green infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More green infrastructure training for municipal staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Green infrastructure certification programs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lifetime maintenance cost and performance analyses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grants for green infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grants for increasing staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Not a solution	Somewhat helpful	Generally helpful	Very helpful	Unknown
Improved manuals and design standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assistance with code and regulation enforcement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assistance with rewriting codes and regulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Revise Department of Ecology's LID credit calculation for a more comprehensive approach to hydrology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clearer definition of LID and "where feasible"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Require LID in all jurisdictions (including those without stormwater permits)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Holding developers accountable for environmental damage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Training for conducting in-house economic analyses that include ecological value of natural resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support for watershed level planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support for inter-jurisdictional collaboration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Making political intervention in established processes more difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identification of important social factors in adoption of green infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Making it more difficult to build using traditional (grey) infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allow Local Integrating Organizations (LIOs) more control of funding resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Not a solution	Somewhat helpful	Generally helpful	Very helpful	Unknown
Streamline review process among state and federal agencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guidance on effective use of incentives, including non-financial options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More regulatory flexibility when green infrastructure would meet the spirit but not the letter of the law	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Develop best practices for LID in agricultural settings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Region-wide education and behavior change efforts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dissemination of green infrastructure success stories	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

## Municipal Structure

**This page requests general information about the division(s) within your municipality that will enable researchers to draw comparisons and contrasts within your municipality.**

11. Which of the following best describes your role at your respective municipality?

- Executive staff
- Middle management
- Line staff
- Not a municipal employee
- Other (please specify)

12. Which of the following best describes the municipal division(s) where you work? Check all that apply.

- Planning
- Permitting
- Engineering
- Public Works
- Surface Water Management
- Community Development
- Parks
- Maintenance
- Airport
- Education and Outreach
- Roads
- Natural Resources
- Municipal Manager/Executive
- Elected Officials
- Other (please specify)

13. Which of the following functions are you involved with in your current municipal role? Check all that apply.

- Stormwater management
- Endangered species
- Habitat
- Water quality
- Low Impact Development (LID)
- Shoreline Master Program (SMP)
- Other (please specify)

14. How would you rate the effectiveness of communication between your current division and the following areas in your municipality?

	Poor	Needs Improvement	Good	Very Effective	N/A
Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Permitting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public Works	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Surface Water Management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Parks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Airport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Education and Outreach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Roads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Natural Resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Municipal Manager/Executive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Elected Municipal Council	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

### Qualitative Feedback

This page provides an opportunity to offer qualitative comments and suggestions.

15. What else would you like us to know or consider related to green infrastructure at your municipality?

## Appendix G

### Key to Survey Variable Codes

**Q1. Municipality Characteristics: Which of the following best describes the municipality where you work?**

- 1 - City
- 2 - County
- 0 - Other

**Q2. Municipality Characteristics: Which of the following best describes your municipal jurisdiction?**

- 1 - Urban (including suburban)
- 2 - Rural
- 3 - Both urban and rural

**Q3. Municipality Characteristics: Which of the following best describes the population of your municipality?**

- 1 - Very large
- 2 - Large
- 3 - Mid-sized
- 4 - Small
- 0 - Unknown

**Q4. Municipality Characteristics: Which of the following best describes your municipality's current relationship to the NPDES stormwater program?**

- 1 - Phase I permittee
- 2 - Phase II permittee
- 3 - Not an NPDES permittee
- 0 - Unknown

**Q5. Municipality Characteristics: Within which of WA Department of Ecology's regions is your municipality located?**

- 1 - Northwest
- 2 - Southwest
- 3 - Other
- 0 - Other

**Q6. Green Infrastructure Successes: Which of the following examples of green infrastructure policy and/or projects has your community successfully implemented? Check all that apply.**

- Q6.01 Habitat restoration
- Q6.02 Critical Areas Ordinances
- Q6.03 Updated codes & reg's to allow for Low Impact Development (LID)
- Q6.04 Pervious pavement
- Q6.05 Wildlife corridors
- Q6.06 Shoreline Master Program (SMP)
- Q6.07 Endangered species recovery plan(s)
- Q6.08 Green roof(s)

- Q6.09 Rain gardens/bioinfiltration
- Q6.10 Community garden(s)
- Q6.11 Green certifications (LEED, Built Green, Energy Star, Green Roads, CESCL, etc.)
- Q6.12 Cluster development
- Q6.13 Tree preservation
- Q6.14 Environmental education
- Q6.15 Social marketing/public behavior change campaigns
- Q6.16 Curb-side composting
- Q6.17 Curb-side recycling
- Q6.18 Roundabout(s)
- Q6.19 Narrow &/or curbless roads
- Q6.20 Economic analyses that include ecological value of natural resources
- Q6.21 Soft shoreline protection
- Q6.22 Bike paths & lanes
- Q6.23 Demonstration project(s)
- Q6.24 Flood plain restoration
- Q6.25 Other (please specify)

**Q7. Barriers to Green Infrastructure Implementation: Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.**

- Q7.01 Soil suitability for infiltration
- Q7.02 Availability of contractors with appropriate skills
- Q7.03 Maintenance and durability
- Q7.04 Project cost
- Q7.05 Insufficient municipal staff
- Q7.06 Staff need more training
- Q7.07 Risk/liability
- Q7.08 Need more or improved guidance (manuals/design standards)
- Q7.09 Guidance available is not relevant to this municipality
- Q7.10 Aesthetics
- Q7.11 Insufficient enforcement of existing codes and regulations
- Q7.12 Conflicting mandates, codes, and regulations
- Q7.13 Restrictions on spending public money on private property
- Q7.14 New development is moving to neighboring jurisdictions where LID is not required
- Q7.15 Projects too small and dispersed
- Q7.16 Access for fire, safety, disability, solid waste, etc.
- Q7.17 Property rights concerns
- Q7.18 Developers not held accountable for environmental damage
- Q7.19 Insufficient impact fees
- Q7.20 Initial costs are short-term, economic benefits are long-term
- Q7.21 Longer processes for permitting
- Q7.22 Lack of public demand
- Q7.23 Coordination with other jurisdictions



- Q7.24 Public resistance
- Q7.25 Uncertainties in performance and cost
- Q7.26 Conflicting priorities across municipal divisions
- Q7.27 Municipal staff resistant to change
- Q7.28 Fragmented jurisdictions and responsibilities
- Q7.29 Intervention by elected officials
- Q7.30 Difficult for public agencies to ensure proper maintenance is occurring on private property
- Q7.31 Natural resources defined by commercial not ecological value
- Q7.32 Legacy infrastructure doesn't comply w/ present standards
- Q7.33 Lack of public understanding of shoreline processes
- Q7.34 Management vision and priorities
- Q7.35 Unequal ability of some social groups to access incentives
- Q7.36 Lack of available space
- Q7.37 Unclear definitions of LID & 'where feasible'
- Q7.38 Spill and pollution prevention
- Q7.39 Insufficient mandate for LID
- Q7.40 Other

**Q9. Potential Solutions: Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.**

- Q9.01 Localized manuals and design standards
- Q9.02 Using LID designs that do not require infiltration on unsuitable soils
- Q9.03 Maps showing soil suitability for various LID techniques
- Q9.04 More frequent inspections of stormwater facilities
- Q9.05 Grouping small projects within neighborhood clusters
- Q9.06 Engaging stakeholders from fire, safety, disability, solid waste, etc. in code revisions
- Q9.07 Increasing impact fees
- Q9.08 Economic analyses that include ecological value of natural resources
- Q9.09 More strategic mitigation (i.e. banking in lieu fees, etc)
- Q9.10 Expedited permits as incentive
- Q9.11 Local education and behavior change efforts
- Q9.12 Reorganization of structural divisions and functions within your municipality
- Q9.13 Bring engineers, permitting, planning, natural resource, and maintenance staff together to address communication challenges
- Q9.14 Maintenance training for private property holders
- Q9.15 Incentives for retrofits of existing infrastructure
- Q9.16 Incentives for removal of hard armoring on shorelines
- Q9.17 Stronger support for green infrastructure from upper management
- Q9.18 Consider stormwater design at outset of a project
- Q9.19 Limit and/or require mitigation for impervious surfaces
- Q9.20 Charge stormwater fees based upon amount of discharge
- Q9.21 Demonstration projects

Q9.22 Other

**Q10. Potential Solutions: Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.**

- Q10.01 Tighter regulations requiring green infrastructure
- Q10.02 More green infrastructure training for municipal staff
- Q10.03 Green infrastructure certification programs
- Q10.04 Lifetime maintenance cost and performance analyses
- Q10.05 Grants for green infrastructure
- Q10.06 Grants for increasing staff
- Q10.07 Improved manuals and design standards
- Q10.08 Assistance with code regulation enforcement
- Q10.09 Assistance with rewriting codes and regulations
- Q10.10 Revise department of Ecology's Low Impact Development credit calculation for comprehensive approach to hydrology
- Q10.11 Clearer definition of LID and 'where feasible'
- Q10.12 Require LID in all jurisdictions (incl. non-permittees)
- Q10.13 Holding developers accountable for environmental damage
- Q10.14 Training for conducting in-house economic analysis that include ecological value of natural resources
- Q10.15 Support for watershed planning
- Q10.16 Support for inter-jurisdictional collaboration
- Q10.17 Making political intervention in established processes more difficult
- Q10.18 Identification of important social factors in adoption of green infrastructure
- Q10.19 Making it more difficult to build using traditional (grey) infrastructure
- Q10.20 Allow local integrating organizations LIOs more control of funding resources
- Q10.21 Streamline review process among state and federal agencies
- Q10.22 Guidance on effective use of incentives, including non-financial options
- Q10.23 More regulatory flexibility when green infrastructure would meet the spirit but not the letter of the law
- Q10.24 Develop best practices for lid in agricultural settings
- Q10.25 Region-wide education & behavior change efforts
- Q10.26 Dissemination of green infrastructure success stories
- Q10.27 Other

**Q11. Municipal Structure: Which of the following best describes your role at your respective municipality?**

- 1 – Executive staff
- 2 – Middle management
- 3 – Line staff
- 4 – Not a municipal employee
- 0 – Other

**Q12. Municipal Structure: Which of the following best describes the municipal division(s) where you work? Check all that apply.**

- Q12.01 Planning
- Q12.02 Permitting
- Q12.03 Engineering
- Q12.04 Public Works
- Q12.05 Surface Water Management
- Q12.06 Community Development
- Q12.07 Parks
- Q12.08 Maintenance
- Q12.09 Airport
- Q12.10 Education & Outreach
- Q12.11 Roads
- Q12.12 Natural Resources
- Q12.13 Municipal Manager/Executive
- Q12.14 Elected Officials
- Q12.15 Other

**Q13. Municipal Structure: Which of the following functions are you involved with in your current municipal role? Check all that apply.**

- Q13.01 Stormwater Management
- Q13.02 Endangered species
- Q13.03 Habitat
- Q13.04 Water quality
- Q13.05 Low Impact Development (LID)
- Q13.06 Shoreline Master Program (SMP)
- Q13.07 Other

**Q14. Municipal Structure: How would you rate the effectiveness of communication between your current division and the following areas in your municipality?**

- Q14.01 Planning
- Q14.02 Permitting
- Q14.03 Public Works
- Q14.04 Surface Water Management
- Q14.05 Community Development
- Q14.06 Parks
- Q14.07 Maintenance
- Q14.08 Airport
- Q14.09 Education & Outreach
- Q14.10 Roads
- Q14.11 Natural Resources
- Q14.12 Municipal Manager/Executive
- Q14.13 Elected Municipal Council
- Q14.14 Other

## Appendix H

### Ethical Standards

Throughout this research project we took the following measures protect the confidentiality of consultants, interviewees, and survey respondents to obtain informed consent prior to recording interviews. Prior to the start of the project we submitted an application to the Institutional Review Board (IRB) at Edmonds Community College. The IRB approved the measures described below and we implemented them throughout the project. During participant observation we identified ourselves as researchers studying green infrastructure policy integration in Puget Sound municipalities. We removed all potential identifiers from our transcribed field notes. We asked interviewees to read and sign an informed consent form prior to the beginning of a semi-structured interview (see Appendix D). Electronic copies of consent forms are maintained in password protected files and originals will be destroyed before the conclusion of the project. Informed consent was also be requested electronically prior to the beginning of each survey (see Appendix F). No names were collected on the anonymous surveys. Interview transcripts and survey responses were assigned a numeric code not linked to names or contact information. Interview questions asking about potential future interviewees were not be recorded. Hand-written or printed names and contact information for potential interviewees will be shredded before the conclusion of the project. Electronic correspondence with interviewees is not linked to specific transcripts and will be deleted prior to the conclusion of the project. Audio files of interviews are stored and were transferred between researchers and transcription service under password protection. Identifying information in transcripts was replaced by generic terms (e.g. large urban county, small rural town, etc.). Audio recordings will be deleted before the completion of the project. Sharing of research data with Puget Sound Partnership is in an aggregate form to prevent the identification of specific municipalities or individual employees. Collectively, these measures help protect the integrity of our data and ensure that no harm comes to our participants from the information they might share with us.

## Appendix I

### Survey Reliability Statistics

The resulting total number of respondents in the study sample is 216 with multiple missing values across all variables based upon the SPSS practice of removing variables in a listwise manner, which is much like throwing the baby out with the bathwater. When this is the case, I replace the missing variable values with imputed series means within each Likert-type item group.

**Table x. Case Processing Summary for “Barriers to Green Infrastructure Implementation: Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.” (Q7)**

		N	%
Cases	Valid	216	100
	Excluded <sup>a</sup>	0	0
	Total	216	100.0

a. Listwise deletion based on all variables in the procedure.

**Table x. Reliability Statistics for “Barriers to Green Infrastructure Implementation: Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.” (Q7)**

Cronbach's	
Alpha	N of Items
.949	40

The Cronbach's Alpha value for this item is greater than 0.70; therefore, this item is internally consistent and reliable for the purposes of this study.

**Table x. Case Processing Summary for “Potential Solutions: Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction.” (Q9)**

		N	%
Cases	Valid	216	100.0
	Excluded <sup>a</sup>	0	.0
	Total	216	100.0

a. Listwise deletion based on all variables in the procedure.

**Table x. Reliability Statistics for “Potential Solutions: Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development.” (Q9)**

Cronbach's	
Alpha	N of Items
.904	22

The Cronbach’s Alpha value for this item is greater than 0.70; therefore, this item is internally consistent and reliable for the purposes of this study.

**Table x. Case Processing Summary for “Potential Solutions: Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction.” (Q10)**

		N	%
Cases	Valid	216	100.0
	Excluded <sup>a</sup>	0	.0
	Total	216	100.0

a. Listwise deletion based on all variables in the procedure.

**Table x. Reliability Statistics for “Potential Solutions: Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction.” (Q10)**

Cronbach's	
Alpha	N of Items
.910	27

The Cronbach’s Alpha value for this item is greater than 0.70; therefore, this item is internally consistent and reliable for the purposes of this study.

**Table x. Case Processing Summary for “Municipal Structure: How would you rate the effectiveness of communication between your current division and the following areas in your municipality?” (Q14)**

		N	%
Cases	Valid	216	100.0
	Excluded <sup>a</sup>	0	.0
	Total	216	100.0

- 
- a. Listwise deletion based on all variables in the procedure.

**Table x. Reliability Statistics for “Municipal Structure: How would you rate the effectiveness of communication between your current division and the following areas in your municipality?” (Q14)**

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Cronbach's	
Alpha	N of Items
.778	14

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The Cronbach’s Alpha value for this item is greater than 0.70; therefore, this item is internally consistent and reliable for the purposes of this study.

All study Likert-type scalar survey items exceed the desired Cronbach’s Alpha index value of 0.70. We may now proceed with ANOVA analysis using items Q1, Q2, Q3, Q 4, Q5, and Q11 (independent demographic variables) against items 7, 9, 10, and 14 (dependent outcome variables).

## Appendix J

### One-way ANOVA Results

Please note that only relations in which the significance value is less than .05 are displayed in the tables below; therefore the null hypothesis is rejected for each relation. When a significance value is less than .05, it means there is a greater than 95% chance a significant relationship (influence) exists between the independent and dependent variables.

#### Q1:Q7

Is there a statistically significant relationship between “Which of the following best describes the municipality where you work?” (Q1) and any of item attributes of “Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction” (Q7)?

The null hypothesis is rejected for all items in Table 7.1 below.

*Table 7.1 One Way ANOVA Results: Q1:Q7*

Item	df	F	Sig.
Q7.11 Insufficient enforcement of existing codes & regulations	1	10.326	.002
Q7.18 Developers not held accountable for environmental damage	1	10.933	.001

#### Q2:Q7

Is there a statistically significant relationship between “Which of the following best describes your municipal jurisdiction?” (Q2) and any of the item attributes of “Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction” (Q7)?

The null hypothesis is rejected for all items in Table 7.2 below.

*Table 7.2 One Way ANOVA Results: Q2:Q7*

Item	df	F	Sig.
Q7.11 Insufficient enforcement of existing codes & regulations	2	4.549	.012
Q7.23 Coordination with other jurisdictions	2	4.129	.017
Q7.28 Fragmented jurisdictions and responsibilities	2	3.398	.035

#### Q3:Q7

Is there a statistically significant relationship between “Which of the following best describes the population of your municipality?” (Q3) and any of the item attributes of “Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction” (Q7)?

The null hypothesis is rejected for the item in Table 7.3 below.

*Table 7.3 One Way ANOVA Results: Q3:Q7*



Item	Df	F	Sig.
Q7.26 Conflicting priorities across municipal divisions	4	2.843	.025

#### Q4:Q7

Is there a statistically significant relationship between item “Which of the following best describes your municipality's current relationship to the NPDES stormwater program?” (Q4) and any of the item attributes of “Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction” (Q7)?

The null hypothesis is rejected for all items in Table 7.4 below.

*Table 7.4 One Way ANOVA Results: Q4:Q7*

Item	df	F	Sig.
Q7.01 Soil suitability for infiltration	3	3.174	.025

#### Q5:Q7

Is there a statistically significant relationship between “Within which of WA Department of Ecology's regions is your municipality located?” (Q5) and any of the item attributes of “Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction” (Q7)?

The null hypothesis is rejected for the item in Table 7.5 below.

*Table 7.5 One Way ANOVA Results: Q5:Q7*

Item	Df	F	Sig.
Q7.39 Insufficient mandate for low impact development	2	3.944	.021

#### Q11:Q7

Is there a statistically significant relationship between “Which of the following best describes your role at your respective municipality?” (Q11) and any of the item attributes of “Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction” (Q7)?

The null hypothesis is rejected for all items in Table 7.6 below.

*Table 7.6 One Way ANOVA Results: Q11:Q7*

Item	df	F	Sig.
Q7.27 Municipal staff resistant to change	3	4.199	.007
Q7.28 Fragmented jurisdictions and responsibilities	3	2.970	.034
Q7.34 Management vision and priorities	3	5.424	.001
Q7.35 Unequal ability of some social groups to access incentives	3	2.925	.036

#### Q1:Q9

Is there a statistically significant relationship between “Which of the following best describes the municipality where you work?” (Q1) and any of the item attributes of “Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction” (Q9)?

The null hypothesis is rejected for the item in Table 7.7 below.

*Table 7.7 One Way ANOVA Results: Q1:Q9*

Item	df	F	Sig.
Q9.04 More frequent inspections of stormwater facilities	1	5.015	.026

**Q2:Q9**

Is there a statistically significant relationship between “Which of the following best describes your municipal jurisdiction?” (Q2) and any of the item attributes of “Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction” (Q9)?

No significant relationships exist; therefore, the null hypothesis is accepted.

**Q3:Q9**

Is there a statistically significant relationship between “Which of the following best describes the population of your municipality?” (Q3) and any of the item attributes of “Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction” (Q9)?

The null hypothesis is rejected for all items in Table 7.8 below.

*Table 7.8 One Way ANOVA Results: Q3:Q9*

Item	Df	F	Sig.
Q9.10 expedited permits as incentive	4	3.138	.016

**Q4:Q9**

Is there a statistically significant relationship between “Which of the following best describes your municipality's current relationship to the NPDES stormwater program?” (Q4) and any of the item attributes of “Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction” (Q9)?

The null hypothesis is rejected for all items in Table 7.9 below.

*Table 7.9 One Way ANOVA Results: Q4:Q9*

Item	Df	F	Sig.
Q9.11 Local education and behavior change efforts	3	3.114	.027
Q9.15 Incentives for retrofits of existing infrastructure	3	3.361	.020

**Q5:Q9**

Is there a statistically significant relationship between “Within which of WA Department of Ecology's regions is your municipality located?” (Q5) and any of the item attributes of “Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction” (Q9)?

The null hypothesis is rejected for all items in Table 7.10 below.

*Table 7.10 One Way ANOVA Results: Q5:Q9*

Item	df	F	Sig.
Q9.09 More strategic mitigation (I.E. banking in lieu fees, etc)	2	4.345	.014
Q9.17 Stronger support for green infrastructure from upper management	2	5.437	.005

**Q11:Q9**

Is there a statistically significant relationship between “Which of the following best describes your role at your respective municipality?” (Q11) and any of the item attributes of “Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction” (Q9)?

The null hypothesis is rejected for the item in Table 7.11 below.

*Table 7.11 One Way ANOVA Results: Q11:Q9*

Item	df	F	Sig.
Q9.14 Maintenance training for private property holders	3	3.535	.017

**Q1:Q10**

Is there a statistically significant relationship between “Which of the following best describes the municipality where you work?” (Q1) and any of the item attributes of “Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction” (Q10)?

The null hypothesis is rejected for all items in Table 7.12 below.

*Table 7.12 One Way ANOVA Results: Q1:Q10*

Item	df	F	Sig.
Q10.04 Lifetime maintenance cost and performance analyses	1	5.223	.023
Q10.13 Holding developers accountable for environmental damage	1	5.470	.020
Q10.23 More regulatory flexibility when green infrastructure would meet the spirit but not the letter of the law	1	7.227	.008
Q10.24 Develop best practices for LID in agricultural settings	1	8.895	.003

**Q2:Q10**

Is there a statistically significant relationship between “Which of the following best describes your municipal jurisdiction?” (Q2) and any of the item attributes of “Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction” (Q10)?

The null hypothesis is rejected for all items in Table 7.13 below.

*Table 7.13 One Way ANOVA Results: Q2:Q10*

Item	df	F	Sig.
Q10.24 Develop best practices for LID in agricultural settings	2	5.675	.004

**Q3:Q10**

Is there a statistically significant relationship between “Which of the following best describes the population of your municipality?” (Q3) and any of the item attributes of “Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction. LID refers to Low Impact Development” (Q10)?

The null hypothesis is rejected for all items in Table 7.14 below.

*Table 7.14 One Way ANOVA Results: Q3:Q10*

Item	df	F	Sig.
Q10.03 Green infrastructure certification programs	4	3.380	.011
Q10.16 Support for inter-jurisdictional collaboration	4	3.910	.004
Q10.25 Region-wide education & behavior change efforts	4	2.836	.025

**Q4:Q10**

Is there a statistically significant relationship between “Which of the following best describes your municipality's current relationship to the NPDES stormwater program?” (Q4) and any of the item attributes of “Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction” Q10?

No significant relationships exist; therefore, the null hypothesis is accepted.

**Q5:Q10**

Is there a statistically significant relationship between “Within which of WA Department of Ecology's regions is your municipality located?” (Q5) and any of the item attributes of “Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction” (Q10)?

The null hypothesis is rejected for all items in Table 7.15 below.

*Table 7.15 One Way ANOVA Results: Q5:Q10*

Item	df	F	Sig.
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Q10.03 Green Infrastructure Certification Programs	2	4.354	.014
Q10.11 Clearer Definition Of Lid And 'Where Feasible'	2	4.061	.019
Q10.23 More regulatory flexibility when green infrastructure would meet the spirit but not the letter of the law	2	3.633	.028

### Q11:Q10

Is there a statistically significant relationship between "Which of the following best describes your role at your respective municipality?" (Q11) and any of the item attributes of "Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction" (Q10)?

No significant relationships exist; therefore, the null hypothesis is accepted.

### Q1:Q14

Is there a statistically significant relationship between "Which of the following best describes the municipality where you work?" (Q1) and any of the item attributes of "How would you rate the effectiveness of communication between your current division and the following areas in your municipality?" (Q14)?

The null hypothesis is rejected for all items in Table 7.16 below.

*Table 7.16 One Way ANOVA Results: Q1:Q14*

Item	df	F	Sig.
Q14.01 Planning	1	15.037	.000
Q14.05 Community Development	1	14.846	.000
Q14.11 Natural Resources	1	3.934	.049
Q14.12 Municipal Manager/Executive	1	6.555	.011

### Q2:Q14

Is there a statistically significant relationship between "Which of the following best describes your municipal jurisdiction?" (Q2) and any of the item attributes of "How would you rate the effectiveness of communication between your current division and the following areas in your municipality?" (Q14)?

The null hypothesis is rejected for all items in Table 7.17 below.

*Table 7.17 One Way ANOVA Results: Q2:Q14*

Item	df	F	Sig.
Q14.01 Planning	2	3.494	.032
Q14.05 Community Development	2	5.131	.007
Q14.11 Natural Resources	2	3.090	.048

### Q3:Q14

Is there a statistically significant relationship between “Which of the following best describes the population of your municipality?” (Q3) and any of the item attributes of “How would you rate the effectiveness of communication between your current division and the following areas in your municipality?” (Q14)?

The null hypothesis is rejected for all items in Table 7.18 below.

*Table 7.18 One Way ANOVA Results: Q3:Q14*

Item	df	F	Sig.
Q14.01 Planning	4	6.425	.000
Q14.04 Surface Water Management	4	2.960	.021
Q14.05 Community Development	4	4.348	.002

#### **Q4:Q14**

Is there a statistically significant relationship between “Which of the following best describes your municipality's current relationship to the NPDES stormwater program?” (Q4) and any of the item attributes of “How would you rate the effectiveness of communication between your current division and the following areas in your municipality?” (Q14)?

The null hypothesis is rejected for all items in Table 7.19 below.

*Table 7.19 One Way ANOVA Results: Q4:Q14*

Item	df	F	Sig.
Q14.01 Planning	3	7.021	.000
Q14.03 Public Works	3	6.482	.107
Q14.04 Surface Water Management	3	12.549	.000
Q14.05 Community Development	3	3.713	.012
Q14.07 Maintenance	3	4.218	.006
Q14.09 Education & Outreach	3	3.533	.016
Q14.11 Natural Resources	3	4.143	.007
Q14.12 Municipal Manager/Executive	3	3.538	.016

#### **Q5:Q14**

Is there a statistically significant relationship between “Within which of WA Department of Ecology's regions is your municipality located?” (Q5) and any of the item attributes of “How would you rate the effectiveness of communication between your current division and the following areas in your municipality?” (Q14)?

The null hypothesis is rejected for all items in Table 7.20 below.

*Table 7.20 One Way ANOVA Results: Q5:Q14*

Item	df	F	Sig.
Q14.01 Planning	2	3.527	.031

Q14.14 Other	2	3.139	.045
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**Q11:Q14**

Is there a statistically significant relationship between item “Municipal Structure: Which of the following best describes your role at your respective municipality?” (Q11) and any of the item attributes of “How would you rate the effectiveness of communication between your current division and the following areas in your municipality?” (Q14)?

The null hypothesis is rejected for all items in Table 7.21 below.

*Table 7.21 One Way ANOVA Results: Q11:Q14*

Item	df	F	Sig.
Q14.01 Planning	3	8.654	.000
Q14.02 Permitting	3	5.413	.001
Q14.05 Community Development	3	8.462	.000
Q14.07 Maintenance	3	3.906	.010
Q14.10 Roads	3	3.115	.028
Q14.12 Municipal Manager/Executive	3	7.491	.000
Q14.13 Elected Municipal Council	3	6.135	.001
Q14.14 Other	3	3.240	.024

## Appendix K

### Descriptive Statistics for Barriers

**Research Question 9: How do the perceptions of barriers compare and contrast between cities and counties?**

**Q1. Municipality Characteristics: Which of the following best describes the municipality where you work?**

1 – City

2 - County

**Q7. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction.**

1 – Not a Barrier

2 – Infrequent Barrier

3 – Common Barrier

4 – Persistent Barrier

*Table 8.1 Descriptive Statistics for Barriers: City*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	104	1	4	3.10	.971
Q7.05 INSUFFICIENT MUNICIPAL STAFF	106	1	4	3.08	1.048
Q7.03 MAINTENANCE AND DURABILITY	102	1	4	3.05	.849
Q7.01 SOIL SUITABILITY FOR INFILTRATION	107	1	4	3.05	.884
Q7.04 PROJECT COST	105	1	4	3.03	.935
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	102	1	4	3.00	.890
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	95	1	4	2.99	.951
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	97	1	4	2.98	.979
Q7.22 LACK OF PUBLIC DEMAND	97	1	4	2.75	.936
Q7.17 PROPERTY RIGHTS CONCERNS	96	1	4	2.73	.989
Q7.06 STAFF NEED MORE TRAINING	108	1	4	2.65	1.026
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	105	1	4	2.57	.979
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	98	1	4	2.57	.919
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	88	1	4	2.57	.828
Q7.07 RISK/LIABILITY	85	1	4	2.56	.892
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	85	1	4	2.55	.932
Q7.36 LACK OF AVAILABLE SPACE	107	1	4	2.55	1.066



Q7.24 PUBLIC RESISTANCE	95	1	4	2.51	.966
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	103	1	4	2.49	.999
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	99	1	4	2.48	.930
Q7.34 MANAGEMENT VISION AND PRIORITIES	107	1	4	2.48	.994
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	100	1	4	2.47	.915
Q7.19 INSUFFICIENT IMPACT FEES	85	1	4	2.46	1.053
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	103	1	4	2.44	1.054
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	83	1	4	2.40	1.047
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	109	1	4	2.35	1.057
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	98	1	4	2.30	1.028
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	92	1	4	2.29	.920
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	94	1	4	2.26	1.015
Q7.39 INSUFFICIENT MANDATE FOR LID	100	1	4	2.24	1.065
Q7.15 PROJECTS TOO SMALL AND DISPERSED	96	1	4	2.24	.960
Q7.10 AESTHETICS	103	1	4	2.23	.920
Q7.29 INTERVENTION BY ELECTED OFFICIALS	92	1	4	2.22	.936
Q7.21 LONGER PROCESSES FOR PERMITTING	99	1	4	2.21	1.043
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	70	1	4	1.99	.860
Q7.38 SPILL AND POLLUTION PREVENTION	97	1	4	1.94	.876
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	96	1	4	1.94	.805
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	95	1	4	1.89	.856
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	83	1	4	1.72	.860

*Table 8.2 Descriptive Statistics for Barriers: County*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	41	1	4	3.32	.789
Q7.03 MAINTENANCE AND DURABILITY	44	1	4	3.18	.843
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	42	1	4	3.10	.958
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	34	1	4	3.03	1.087
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	35	1	4	3.03	.985
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	38	1	4	3.03	1.052
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	39	1	4	3.03	1.013
Q7.06 STAFF NEED MORE TRAINING	42	1	4	2.93	.921
Q7.04 PROJECT COST	40	1	4	2.93	.829
Q7.07 RISK/LIABILITY	37	1	4	2.84	1.068
Q7.01 SOIL SUITABILITY FOR INFILTRATION	43	1	4	2.81	.932
Q7.17 PROPERTY RIGHTS CONCERNS	39	1	4	2.79	1.105

Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	39	1	4	2.79	1.031
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	32	1	4	2.78	.975
Q7.05 INSUFFICIENT MUNICIPAL STAFF	41	1	4	2.76	.994
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	42	1	4	2.69	1.047
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	31	1	4	2.65	.950
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	40	1	4	2.63	.925
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	39	1	4	2.62	1.016
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	36	1	4	2.58	.841
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	30	1	4	2.57	1.073
Q7.34 MANAGEMENT VISION AND PRIORITIES	40	1	4	2.55	1.176
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	40	1	4	2.53	1.062
Q7.19 INSUFFICIENT IMPACT FEES	25	1	4	2.52	1.085
Q7.22 LACK OF PUBLIC DEMAND	35	1	4	2.51	1.040
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	37	1	4	2.38	1.037
Q7.24 PUBLIC RESISTANCE	37	1	4	2.35	.949
Q7.39 INSUFFICIENT MANDATE FOR LID	38	1	4	2.32	1.118
Q7.21 LONGER PROCESSES FOR PERMITTING	32	1	4	2.31	.965
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	26	1	4	2.31	1.087
Q7.36 LACK OF AVAILABLE SPACE	42	1	4	2.26	.798
Q7.15 PROJECTS TOO SMALL AND DISPERSED	37	1	4	2.19	.995
Q7.29 INTERVENTION BY ELECTED OFFICIALS	32	1	4	2.19	1.030
Q7.10 AESTHETICS	40	1	4	2.18	.874
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	41	1	4	2.15	.853
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	36	1	4	2.06	.984
Q7.38 SPILL AND POLLUTION PREVENTION	37	1	4	1.89	.936
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	36	1	4	1.69	.889
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	29	1	3	1.69	.761

*Table 8.3 Descriptive Statistics for Barriers: City and County*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	145	1	4	3.16	.926
Q7.03 MAINTENANCE AND DURABILITY	146	1	4	3.09	.846
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	144	1	4	3.03	.908
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	130	1	4	3.00	.956
Q7.04 PROJECT COST	145	1	4	3.00	.905
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	136	1	4	2.99	.985
Q7.05 INSUFFICIENT MUNICIPAL STAFF	147	1	4	2.99	1.040

Q7.01 SOIL SUITABILITY FOR INFILTRATION	150	1	4	2.98	.901
Q7.17 PROPERTY RIGHTS CONCERNS	135	1	4	2.75	1.020
Q7.06 STAFF NEED MORE TRAINING	150	1	4	2.73	1.003
Q7.22 LACK OF PUBLIC DEMAND	132	1	4	2.69	.966
Q7.07 RISK/LIABILITY	122	1	4	2.65	.953
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	144	1	4	2.63	.995
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	120	1	4	2.63	.870
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	137	1	4	2.58	.944
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	115	1	4	2.56	.966
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	143	1	4	2.52	.977
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	147	1	4	2.52	1.094
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	135	1	4	2.51	.905
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	145	1	4	2.51	1.055
Q7.34 MANAGEMENT VISION AND PRIORITIES	147	1	4	2.50	1.043
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	140	1	4	2.49	.956
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	132	1	4	2.48	1.088
Q7.19 INSUFFICIENT IMPACT FEES	110	1	4	2.47	1.055
Q7.36 LACK OF AVAILABLE SPACE	149	1	4	2.47	1.004
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	114	1	4	2.46	1.023
Q7.24 PUBLIC RESISTANCE	132	1	4	2.46	.960
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	131	1	4	2.29	1.019
Q7.39 INSUFFICIENT MANDATE FOR LID	138	1	4	2.26	1.076
Q7.21 LONGER PROCESSES FOR PERMITTING	131	1	4	2.24	1.022
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	128	1	4	2.23	.941
Q7.15 PROJECTS TOO SMALL AND DISPERSED	133	1	4	2.23	.966
Q7.10 AESTHETICS	143	1	4	2.22	.905
Q7.29 INTERVENTION BY ELECTED OFFICIALS	124	1	4	2.21	.957
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	96	1	4	2.07	.932
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	137	1	4	2.00	.822
Q7.38 SPILL AND POLLUTION PREVENTION	134	1	4	1.93	.890
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	131	1	4	1.84	.867
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	112	1	4	1.71	.832

**Research Question 9: How do the perceptions of barriers compare and contrast between urban and rural jurisdictions?**

**Q2. Which of the following best describes your municipal jurisdiction?**

1 - Urban (including suburban)

- 2 - Rural
- 3 - Both urban and rural

**Q7. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction.**

- 1 – Not a Barrier
- 2 – Infrequent Barrier
- 3 – Common Barrier
- 4 – Persistent Barrier

*Table 8.4 Descriptive Statistics for Barriers: Urban*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.03 MAINTENANCE AND DURABILITY	93	1	4	3.04	.767
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	94	1	4	3.03	.905
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	93	1	4	2.97	.799
Q7.01 SOIL SUITABILITY FOR INFILTRATION	95	1	4	2.94	.780
Q7.05 INSUFFICIENT MUNICIPAL STAFF	93	1	4	2.89	.970
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	87	1	4	2.86	.870
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	88	1	4	2.84	.848
Q7.04 PROJECT COST	93	1	4	2.83	.838
Q7.06 STAFF NEED MORE TRAINING	97	1	4	2.58	.904
Q7.17 PROPERTY RIGHTS CONCERNS	87	1	4	2.58	.932
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	95	1	4	2.55	.879
Q7.22 LACK OF PUBLIC DEMAND	85	1	4	2.52	.873
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	94	1	4	2.48	.957
Q7.34 MANAGEMENT VISION AND PRIORITIES	96	1	4	2.45	.879
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	93	1	4	2.45	.812
Q7.36 LACK OF AVAILABLE SPACE	92	1	4	2.44	.907
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	88	1	4	2.43	.832
Q7.07 RISK/LIABILITY	79	1	4	2.39	.818
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	90	1	4	2.38	.856
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	93	1	4	2.37	.854
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	82	1	4	2.34	.732
Q7.24 PUBLIC RESISTANCE	85	1	4	2.31	.884
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	79	1	4	2.30	.942
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	92	1	4	2.26	.889
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	80	1	4	2.25	.857

Q7.19 INSUFFICIENT IMPACT FEES	75	1	4	2.23	.947
Q7.10 AESTHETICS	93	1	4	2.21	.847
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	85	1	4	2.21	.896
Q7.39 INSUFFICIENT MANDATE FOR LID	89	1	4	2.20	.987
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	89	1	4	2.18	.822
Q7.15 PROJECTS TOO SMALL AND DISPERSED	88	1	4	2.15	.854
Q7.21 LONGER PROCESSES FOR PERMITTING	89	1	4	2.14	.905
Q7.29 INTERVENTION BY ELECTED OFFICIALS	85	1	4	2.05	.841
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	86	1	4	2.03	.890
Q7.38 SPILL AND POLLUTION PREVENTION	90	1	4	1.87	.814
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	89	1	4	1.83	.725
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	68	1	4	1.74	.872
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	91	1	4	1.68	.702
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	83	1	4	1.53	.726

*Table 8.5 Descriptive Statistics for Barriers: Rural*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.04 PROJECT COST	23	2	4	3.17	.604
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	24	2	4	3.17	.530
Q7.05 INSUFFICIENT MUNICIPAL STAFF	24	1	4	3.03	.769
Q7.17 PROPERTY RIGHTS CONCERNS	23	2	4	2.89	.693
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	21	1	4	2.87	.863
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	22	1	4	2.86	.730
Q7.01 SOIL SUITABILITY FOR INFILTRATION	21	1	4	2.78	.906
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	23	1	4	2.78	.866
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	24	1	4	2.77	1.001
Q7.06 STAFF NEED MORE TRAINING	24	1	4	2.72	.802
Q7.03 MAINTENANCE AND DURABILITY	23	1	4	2.72	.785
Q7.22 LACK OF PUBLIC DEMAND	24	2	4	2.61	.530
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	24	1	4	2.55	1.100
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	24	1	4	2.53	.732
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	22	1	4	2.53	.785
Q7.24 PUBLIC RESISTANCE	24	2	4	2.51	.650
Q7.07 RISK/LIABILITY	23	1	4	2.48	.991
Q7.39 INSUFFICIENT MANDATE FOR LID	22	1	4	2.48	.975
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	24	1	4	2.48	.856
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	24	1	4	2.46	.845

Q7.36 LACK OF AVAILABLE SPACE	24	1	4	2.44	.903
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	23	1	4	2.43	.732
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	22	1	4	2.40	.893
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	22	2	4	2.39	.616
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	23	1	4	2.33	.876
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	21	1	4	2.32	.946
Q7.19 INSUFFICIENT IMPACT FEES	22	1	4	2.32	1.009
Q7.34 MANAGEMENT VISION AND PRIORITIES	24	1	4	2.30	.705
Q7.15 PROJECTS TOO SMALL AND DISPERSED	22	1	4	2.18	.986
Q7.21 LONGER PROCESSES FOR PERMITTING	23	1	4	2.16	1.015
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	22	1	4	2.13	.809
Q7.29 INTERVENTION BY ELECTED OFFICIALS	23	1	4	2.08	.687
Q7.10 AESTHETICS	24	1	4	2.07	.882
Q7.38 SPILL AND POLLUTION PREVENTION	21	1	4	1.98	.921
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	20	1	4	1.88	.890
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	21	1	4	1.81	.698
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	21	1	4	1.81	.889
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	23	1	3	1.72	.474
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	21	1	3	1.67	.764

*Table 8.6 Descriptive Statistics for Barriers: Urban and Rural*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	79	1	4	3.18	.767
Q7.03 MAINTENANCE AND DURABILITY	78	1	4	3.10	.721
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	79	1	4	3.00	.836
Q7.01 SOIL SUITABILITY FOR INFILTRATION	82	1	4	2.97	.810
Q7.04 PROJECT COST	78	1	4	2.95	.788
Q7.05 INSUFFICIENT MUNICIPAL STAFF	81	1	4	2.93	.894
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	74	1	4	2.89	.913
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	70	1	4	2.84	.892
Q7.06 STAFF NEED MORE TRAINING	81	1	4	2.80	.869
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	77	1	4	2.67	.912
Q7.07 RISK/LIABILITY	70	1	4	2.65	.864
Q7.17 PROPERTY RIGHTS CONCERNS	76	1	4	2.63	.909
Q7.22 LACK OF PUBLIC DEMAND	73	1	4	2.62	.917
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	79	1	4	2.61	.984
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	78	1	4	2.58	.870

Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	78	1	4	2.57	.852
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	65	1	4	2.53	.910
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	73	1	4	2.50	.956
Q7.34 MANAGEMENT VISION AND PRIORITIES	79	1	4	2.50	1.013
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	72	1	4	2.47	.773
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	61	1	4	2.46	.909
Q7.36 LACK OF AVAILABLE SPACE	81	1	4	2.45	.900
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	73	1	4	2.44	.899
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	79	1	4	2.41	.905
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	74	1	4	2.39	.908
Q7.24 PUBLIC RESISTANCE	75	1	4	2.36	.874
Q7.19 INSUFFICIENT IMPACT FEES	61	1	4	2.27	.995
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	62	1	4	2.24	.945
Q7.39 INSUFFICIENT MANDATE FOR LID	75	1	4	2.14	.919
Q7.15 PROJECTS TOO SMALL AND DISPERSED	72	1	4	2.13	.816
Q7.10 AESTHETICS	77	1	4	2.12	.715
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	76	1	4	2.12	.769
Q7.29 INTERVENTION BY ELECTED OFFICIALS	70	1	4	2.12	.895
Q7.21 LONGER PROCESSES FOR PERMITTING	66	1	4	2.11	.902
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	69	1	4	2.10	.815
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	58	1	4	1.89	.922
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	68	1	4	1.85	.798
Q7.38 SPILL AND POLLUTION PREVENTION	74	1	4	1.76	.691
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	56	1	4	1.64	.769

**Research Question 9: How do the perceptions of barriers compare and contrast between very large, large, mid-sized, and small jurisdictions?**

**Q3. Which of the following best describes the population of your municipality?**

- 1 - Very large
- 2 - Large
- 3 - Mid-sized
- 4 - Small

**Q7. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction.**

- 1 – Not a Barrier
- 2 – Infrequent Barrier

3 – Common Barrier

4 – Persistent Barrier

*Table 8.7 Descriptive Statistics for Barriers: Very Large*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	47	1	4	3.23	.840
Q7.03 MAINTENANCE AND DURABILITY	55	1	4	3.13	.818
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	50	1	4	3.12	.982
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	52	1	4	3.12	1.003
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	54	1	4	3.06	.899
Q7.01 SOIL SUITABILITY FOR INFILTRATION	54	1	4	2.96	.910
Q7.04 PROJECT COST	52	1	4	2.85	.916
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	51	1	4	2.80	.939
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	44	1	4	2.80	1.091
Q7.07 RISK/LIABILITY	48	1	4	2.79	1.031
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	53	1	4	2.74	.944
Q7.06 STAFF NEED MORE TRAINING	55	1	4	2.73	.870
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	41	1	4	2.71	1.006
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	50	1	4	2.66	1.118
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	38	1	4	2.66	1.021
Q7.05 INSUFFICIENT MUNICIPAL STAFF	52	1	4	2.65	1.008
Q7.17 PROPERTY RIGHTS CONCERNS	51	1	4	2.61	1.078
Q7.34 MANAGEMENT VISION AND PRIORITIES	53	1	4	2.60	1.080
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	47	1	4	2.57	.927
Q7.22 LACK OF PUBLIC DEMAND	47	1	4	2.55	1.059
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	49	1	4	2.53	.938
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	40	1	4	2.48	.987
Q7.36 LACK OF AVAILABLE SPACE	55	1	4	2.47	.959
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	52	1	4	2.40	.955
Q7.19 INSUFFICIENT IMPACT FEES	30	1	4	2.40	1.070
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	54	1	4	2.39	.920
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	32	1	4	2.38	1.129
Q7.24 PUBLIC RESISTANCE	49	1	4	2.37	.972
Q7.10 AESTHETICS	52	1	4	2.35	.905
Q7.21 LONGER PROCESSES FOR PERMITTING	44	1	4	2.27	1.042
Q7.15 PROJECTS TOO SMALL AND DISPERSED	49	1	4	2.24	1.031
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	51	1	4	2.24	1.012



Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	47	1	4	2.19	.947
Q7.39 INSUFFICIENT MANDATE FOR LID	50	1	4	2.18	1.044
Q7.29 INTERVENTION BY ELECTED OFFICIALS	42	1	4	2.17	1.057
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	52	1	4	2.12	.855
Q7.38 SPILL AND POLLUTION PREVENTION	50	1	4	1.98	.958
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	49	1	4	1.73	.861
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	38	1	3	1.68	.775

*Table 8.9 Descriptive Statistics for Barriers: Large*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	42	2	4	3.36	.727
Q7.03 MAINTENANCE AND DURABILITY	42	2	4	3.31	.715
Q7.05 INSUFFICIENT MUNICIPAL STAFF	40	1	4	3.23	.891
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	41	1	4	3.22	.822
Q7.01 SOIL SUITABILITY FOR INFILTRATION	42	1	4	3.00	.733
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	35	1	4	2.97	.857
Q7.04 PROJECT COST	40	1	4	2.95	.749
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	37	1	4	2.89	.906
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	43	1	4	2.88	.931
Q7.17 PROPERTY RIGHTS CONCERNS	36	1	4	2.83	.878
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	39	1	4	2.82	.756
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	38	1	4	2.76	.883
Q7.06 STAFF NEED MORE TRAINING	44	1	4	2.75	1.014
Q7.22 LACK OF PUBLIC DEMAND	35	1	4	2.71	.860
Q7.07 RISK/LIABILITY	32	1	4	2.69	.780
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	38	1	4	2.68	.873
Q7.19 INSUFFICIENT IMPACT FEES	30	1	4	2.67	.884
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	29	1	4	2.62	.862
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	42	1	4	2.62	1.147
Q7.36 LACK OF AVAILABLE SPACE	38	1	4	2.61	.974
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	30	1	4	2.60	.855
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	34	1	4	2.59	.743
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	40	1	4	2.53	.905
Q7.34 MANAGEMENT VISION AND PRIORITIES	42	1	4	2.52	.943
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	37	1	4	2.49	.901
Q7.39 INSUFFICIENT MANDATE FOR LID	37	1	4	2.49	1.070
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	35	1	4	2.49	.951

Q7.24 PUBLIC RESISTANCE	33	1	4	2.48	.795
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	34	1	4	2.41	.988
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	33	1	4	2.39	.827
Q7.15 PROJECTS TOO SMALL AND DISPERSED	36	1	4	2.39	.688
Q7.21 LONGER PROCESSES FOR PERMITTING	34	1	4	2.38	.922
Q7.10 AESTHETICS	39	1	4	2.26	.880
Q7.29 INTERVENTION BY ELECTED OFFICIALS	32	1	4	2.22	.792
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	38	1	4	2.05	.837
Q7.38 SPILL AND POLLUTION PREVENTION	36	1	4	2.03	.878
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	27	1	4	1.93	.730
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	34	1	4	1.91	.866
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	36	1	3	1.67	.632

*Table 8.10 Descriptive Statistics for Barriers: Mid-sized*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.01 SOIL SUITABILITY FOR INFILTRATION	45	1	4	3.18	.860
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	40	1	4	3.15	.949
Q7.05 INSUFFICIENT MUNICIPAL STAFF	45	1	4	3.13	1.120
Q7.04 PROJECT COST	42	1	4	3.12	.942
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	42	1	4	3.02	.924
Q7.03 MAINTENANCE AND DURABILITY	40	1	4	3.00	.877
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	39	1	4	2.95	.972
Q7.22 LACK OF PUBLIC DEMAND	40	1	4	2.90	.928
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	39	1	4	2.87	1.105
Q7.17 PROPERTY RIGHTS CONCERNS	38	1	4	2.84	1.079
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	33	1	4	2.70	1.015
Q7.06 STAFF NEED MORE TRAINING	42	1	4	2.67	1.162
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	41	1	4	2.59	.865
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	38	1	4	2.58	.858
Q7.19 INSUFFICIENT IMPACT FEES	40	1	4	2.58	1.152
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	42	1	4	2.57	1.039
Q7.34 MANAGEMENT VISION AND PRIORITIES	42	1	4	2.57	1.107
Q7.07 RISK/LIABILITY	34	1	4	2.56	.960
Q7.24 PUBLIC RESISTANCE	41	1	4	2.49	1.098
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	41	1	4	2.49	1.052
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	39	1	4	2.49	.970
Q7.36 LACK OF AVAILABLE SPACE	45	1	4	2.47	1.120

Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	40	1	4	2.43	1.035
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	40	1	4	2.33	.971
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	40	1	4	2.30	1.018
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	34	1	4	2.29	1.115
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	45	1	4	2.29	1.100
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	38	1	4	2.26	1.107
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	43	1	4	2.26	1.093
Q7.29 INTERVENTION BY ELECTED OFFICIALS	40	1	4	2.23	1.025
Q7.39 INSUFFICIENT MANDATE FOR LID	41	1	4	2.22	1.107
Q7.21 LONGER PROCESSES FOR PERMITTING	42	1	4	2.17	1.080
Q7.10 AESTHETICS	42	1	4	2.07	.867
Q7.15 PROJECTS TOO SMALL AND DISPERSED	39	1	4	2.05	.972
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	38	1	4	1.95	.899
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	38	1	4	1.84	.823
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	28	1	4	1.82	.905
Q7.38 SPILL AND POLLUTION PREVENTION	40	1	3	1.73	.679
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	33	1	4	1.61	.864

*Table 8.11 Descriptive Statistics for Barriers: Small*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.04 PROJECT COST	16	1	4	3.25	1.000
Q7.05 INSUFFICIENT MUNICIPAL STAFF	15	1	4	3.07	1.033
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	16	1	4	3.00	1.033
Q7.06 STAFF NEED MORE TRAINING	14	1	4	2.86	1.027
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	14	1	4	2.86	1.231
Q7.17 PROPERTY RIGHTS CONCERNS	15	1	4	2.80	.941
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	17	1	4	2.76	1.251
Q7.24 PUBLIC RESISTANCE	14	1	4	2.71	.914
Q7.03 MAINTENANCE AND DURABILITY	14	1	4	2.71	1.069
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	14	1	4	2.71	.914
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	13	1	4	2.62	.961
Q7.07 RISK/LIABILITY	13	1	4	2.54	1.050
Q7.22 LACK OF PUBLIC DEMAND	15	1	4	2.53	.834
Q7.01 SOIL SUITABILITY FOR INFILTRATION	14	1	4	2.50	1.286
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	12	1	4	2.50	1.000
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	13	1	4	2.46	1.050
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	16	1	4	2.44	1.094

Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	14	1	4	2.43	1.222
Q7.15 PROJECTS TOO SMALL AND DISPERSED	14	1	4	2.43	1.222
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	15	1	4	2.40	1.056
Q7.39 INSUFFICIENT MANDATE FOR LID	15	1	4	2.40	1.183
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	15	1	4	2.40	.986
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	13	1	4	2.38	.961
Q7.36 LACK OF AVAILABLE SPACE	16	1	4	2.38	1.025
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	12	1	4	2.33	.985
Q7.29 INTERVENTION BY ELECTED OFFICIALS	15	1	4	2.27	.884
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	12	1	4	2.25	.754
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	15	1	4	2.20	1.146
Q7.10 AESTHETICS	15	1	4	2.07	1.100
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	15	1	4	2.07	.961
Q7.21 LONGER PROCESSES FOR PERMITTING	16	1	4	2.06	1.063
Q7.38 SPILL AND POLLUTION PREVENTION	13	1	4	2.00	1.155
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	15	1	4	2.00	1.000
Q7.19 INSUFFICIENT IMPACT FEES	14	1	4	2.00	1.038
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	15	1	4	1.93	.961
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	14	1	3	1.93	.730
Q7.34 MANAGEMENT VISION AND PRIORITIES	15	1	3	1.87	.834
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	12	1	3	1.75	.754
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	12	1	4	1.67	.888

**Q7. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction.**

- 1 – Not a Barrier
- 2 – Infrequent Barrier
- 3 – Common Barrier
- 4 – Persistent Barrier

**Q5. Within which of WA Department of Ecology's regions is your municipality located?**

- 1 - Northwest
- 2 - Southwest
- 3 - Both

*Table 8.12 Descriptive Statistics for Barriers: Northwest region*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	136	1	4	3.15	.828
Q7.03 MAINTENANCE AND DURABILITY	135	1	4	3.05	.756
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	135	1	4	2.96	.762
Q7.01 SOIL SUITABILITY FOR INFILTRATION	140	1	4	2.92	.812
Q7.05 INSUFFICIENT MUNICIPAL STAFF	140	1	4	2.91	.916
Q7.04 PROJECT COST	135	1	4	2.89	.826
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	130	1	4	2.82	.855
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	124	1	4	2.76	.839
Q7.06 STAFF NEED MORE TRAINING	142	1	4	2.71	.885
Q7.17 PROPERTY RIGHTS CONCERNS	129	1	4	2.58	.901
Q7.22 LACK OF PUBLIC DEMAND	128	1	4	2.57	.842
Q7.34 MANAGEMENT VISION AND PRIORITIES	137	1	4	2.57	.917
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	136	1	4	2.56	.884
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	141	1	4	2.54	.941
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	137	1	4	2.50	.955
Q7.36 LACK OF AVAILABLE SPACE	137	1	4	2.50	.923
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	131	1	4	2.47	.855
Q7.07 RISK/LIABILITY	119	1	4	2.46	.858
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	136	1	4	2.44	.864
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	131	1	4	2.42	.860
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	120	1	4	2.36	.796
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	128	1	4	2.35	.989
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	127	1	4	2.35	.796
Q7.24 PUBLIC RESISTANCE	130	1	4	2.34	.863
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	116	1	4	2.32	.914
Q7.19 INSUFFICIENT IMPACT FEES	109	1	4	2.27	.954
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	111	1	4	2.25	.881
Q7.39 INSUFFICIENT MANDATE FOR LID	126	1	4	2.24	.962
Q7.10 AESTHETICS	134	1	4	2.20	.826
Q7.21 LONGER PROCESSES FOR PERMITTING	126	1	4	2.17	.946
Q7.15 PROJECTS TOO SMALL AND DISPERSED	126	1	4	2.16	.866
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	127	1	4	2.15	.924
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	125	1	4	2.13	.889
Q7.29 INTERVENTION BY ELECTED OFFICIALS	122	1	4	2.08	.807
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	130	1	4	1.90	.730

Q7.38 SPILL AND POLLUTION PREVENTION	129	1	4	1.85	.780
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	104	1	4	1.74	.842
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	126	1	4	1.74	.757
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	110	1	4	1.52	.706

*Table 8.13 Descriptive Statistics for Barriers: Southwest region*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	51	1	4	3.04	.890
Q7.04 PROJECT COST	54	1	4	3.03	.729
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	51	1	4	2.99	.957
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	56	1	4	2.97	.788
Q7.01 SOIL SUITABILITY FOR INFILTRATION	53	1	4	2.95	.792
Q7.03 MAINTENANCE AND DURABILITY	55	1	4	2.94	.762
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	55	1	4	2.92	.899
Q7.05 INSUFFICIENT MUNICIPAL STAFF	55	1	4	2.92	.899
Q7.17 PROPERTY RIGHTS CONCERNS	53	1	4	2.77	.887
Q7.06 STAFF NEED MORE TRAINING	55	1	4	2.65	.878
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	49	1	4	2.62	.791
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	54	1	4	2.58	.851
Q7.22 LACK OF PUBLIC DEMAND	51	1	4	2.58	.901
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	52	1	4	2.56	.816
Q7.07 RISK/LIABILITY	49	1	4	2.56	.864
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	49	1	4	2.55	.873
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	53	1	4	2.52	.776
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	54	1	4	2.46	.839
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	50	1	4	2.44	.905
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	54	1	4	2.42	.983
Q7.24 PUBLIC RESISTANCE	52	1	4	2.39	.792
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	51	1	4	2.38	.835
Q7.36 LACK OF AVAILABLE SPACE	55	1	4	2.25	.797
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	53	1	4	2.21	.814
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	50	1	4	2.21	.810
Q7.19 INSUFFICIENT IMPACT FEES	45	1	4	2.19	1.015
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	44	1	4	2.15	.972
Q7.34 MANAGEMENT VISION AND PRIORITIES	57	1	4	2.15	.853
Q7.29 INTERVENTION BY ELECTED OFFICIALS	53	1	4	2.09	.925
Q7.15 PROJECTS TOO SMALL AND DISPERSED	51	1	4	2.07	.837

Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	50	1	4	2.05	.662
Q7.10 AESTHETICS	55	1	4	2.05	.706
Q7.39 INSUFFICIENT MANDATE FOR LID	56	1	4	2.04	.904
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	54	1	4	2.01	.740
Q7.21 LONGER PROCESSES FOR PERMITTING	48	1	4	2.00	.750
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	40	1	4	1.95	.929
Q7.38 SPILL AND POLLUTION PREVENTION	51	1	4	1.86	.796
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	50	1	4	1.76	.792
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	46	1	4	1.67	.797

*Table 8.14 Descriptive Statistics for Barriers: Both Northwest and Southwest region*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	5	3	4	3.54	.638
Q7.05 INSUFFICIENT MUNICIPAL STAFF	4	2	4	3.50	1.000
Q7.03 MAINTENANCE AND DURABILITY	5	3	4	3.35	.600
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	6	3	4	3.33	.516
Q7.39 INSUFFICIENT MANDATE FOR LID	5	2	4	3.19	.862
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	6	2	4	3.17	.753
Q7.01 SOIL SUITABILITY FOR INFILTRATION	6	2	4	3.12	.773
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	5	2	4	3.08	.913
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	6	2	4	3.02	.866
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	6	2	4	3.02	.873
Q7.07 RISK/LIABILITY	5	2	4	3.00	.994
Q7.36 LACK OF AVAILABLE SPACE	6	2	4	2.88	.944
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	6	2	4	2.88	.702
Q7.17 PROPERTY RIGHTS CONCERNS	5	2	4	2.80	.837
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	5	2	3	2.80	.447
Q7.34 MANAGEMENT VISION AND PRIORITIES	6	1	3	2.67	.816
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	6	1	4	2.67	1.033
Q7.21 LONGER PROCESSES FOR PERMITTING	5	1	4	2.56	1.369
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	4	2	4	2.50	1.000
Q7.22 LACK OF PUBLIC DEMAND	4	2	3	2.50	.577
Q7.06 STAFF NEED MORE TRAINING	6	1	3	2.50	.837
Q7.15 PROJECTS TOO SMALL AND DISPERSED	6	2	3	2.47	.581
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	4	2	3	2.45	.641
Q7.04 PROJECT COST	6	2	3	2.44	.501
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	4	2	3	2.44	.652

Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	4	2	3	2.37	.477
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	5	1	3	2.35	.928
Q7.19 INSUFFICIENT IMPACT FEES	5	1	3	2.33	.941
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	3	1	3	2.33	1.155
Q7.24 PUBLIC RESISTANCE	3	1	4	2.33	1.528
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	5	1	3	2.24	.769
Q7.10 AESTHETICS	6	1	3	2.17	.983
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	5	1	3	2.10	.552
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	5	1	3	2.05	.717
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	5	2	2	2.00	.011
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	4	1	3	2.00	.816
Q7.29 INTERVENTION BY ELECTED OFFICIALS	4	1	3	2.00	.816
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	5	1	3	2.00	.707
Q7.38 SPILL AND POLLUTION PREVENTION	6	1	2	1.43	.497

**Research Question 9: How do perceptions of barriers compare and contrast between stormwater permittees and non-permittees?**

**Q4. Which of the following best describes your municipality's current relationship to the NPDES stormwater program?**

- 1 - Phase I permittee
- 2 - Phase II permittee
- 3 - Not an NPDES permittee

**Q7. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction.**

- 1 – Not a Barrier
- 2 – Infrequent Barrier
- 3 – Common Barrier
- 4 – Persistent Barrier

*Table 8.15 Descriptive Statistics for Barriers: Phase I NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	38	1	4	3.26	.860
Q7.03 MAINTENANCE AND DURABILITY	43	2	4	3.23	.751
Q7.01 SOIL SUITABILITY FOR INFILTRATION	44	1	4	3.11	.868



Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	42	1	4	3.10	.759
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	36	1	4	3.08	.906
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	39	1	4	3.05	.999
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	39	1	4	2.92	.929
Q7.04 PROJECT COST	39	1	4	2.90	.940
Q7.06 STAFF NEED MORE TRAINING	41	1	4	2.88	.927
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	39	1	4	2.82	.997
Q7.07 RISK/LIABILITY	37	1	4	2.78	.976
Q7.34 MANAGEMENT VISION AND PRIORITIES	39	1	4	2.77	1.063
Q7.05 INSUFFICIENT MUNICIPAL STAFF	39	1	4	2.77	1.012
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	37	1	4	2.70	1.175
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	30	1	4	2.70	.952
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	40	1	4	2.70	1.067
Q7.22 LACK OF PUBLIC DEMAND	33	1	4	2.64	1.113
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	33	1	4	2.61	1.029
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	40	1	4	2.58	.958
Q7.36 LACK OF AVAILABLE SPACE	44	1	4	2.48	1.023
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	34	1	4	2.47	.961
Q7.17 PROPERTY RIGHTS CONCERNS	37	1	4	2.43	1.015
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	40	1	4	2.43	.931
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	43	1	4	2.42	.852
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	32	1	4	2.41	1.073
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	24	1	4	2.38	1.096
Q7.10 AESTHETICS	40	1	4	2.38	.925
Q7.24 PUBLIC RESISTANCE	36	1	4	2.36	.961
Q7.21 LONGER PROCESSES FOR PERMITTING	36	1	4	2.36	1.046
Q7.39 INSUFFICIENT MANDATE FOR LID	40	1	4	2.33	.997
Q7.19 INSUFFICIENT IMPACT FEES	25	1	4	2.32	1.108
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	37	1	4	2.30	1.051
Q7.15 PROJECTS TOO SMALL AND DISPERSED	40	1	4	2.20	.966
Q7.29 INTERVENTION BY ELECTED OFFICIALS	32	1	4	2.16	1.081
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	39	1	4	2.15	.875
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	34	1	4	2.15	.958
Q7.38 SPILL AND POLLUTION PREVENTION	38	1	4	1.89	.894
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	39	1	4	1.77	.872
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	27	1	3	1.74	.712

*Table 8.16 Descriptive Statistics for Barriers: Phase II NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	83	1	4	3.18	.926
Q7.03 MAINTENANCE AND DURABILITY	79	1	4	3.14	.843
Q7.01 SOIL SUITABILITY FOR INFILTRATION	83	1	4	3.10	.821
Q7.05 INSUFFICIENT MUNICIPAL STAFF	81	1	4	3.07	1.010
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	81	1	4	3.06	.953
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	71	1	4	2.99	.964
Q7.04 PROJECT COST	79	1	4	2.97	.877
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	75	1	4	2.95	.914
Q7.17 PROPERTY RIGHTS CONCERNS	76	1	4	2.87	.998
Q7.22 LACK OF PUBLIC DEMAND	75	1	4	2.71	.955
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	81	1	4	2.69	.917
Q7.07 RISK/LIABILITY	66	1	4	2.62	.941
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	81	1	4	2.60	.983
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	59	1	4	2.59	.873
Q7.06 STAFF NEED MORE TRAINING	84	1	4	2.56	1.022
Q7.19 INSUFFICIENT IMPACT FEES	63	1	4	2.56	1.059
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	75	1	4	2.55	.977
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	75	1	4	2.52	.921
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	77	1	4	2.51	.968
Q7.36 LACK OF AVAILABLE SPACE	78	1	4	2.50	1.016
Q7.24 PUBLIC RESISTANCE	70	1	4	2.50	.989
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	68	1	4	2.49	.872
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	60	1	4	2.48	1.000
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	74	1	4	2.45	.846
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	69	1	4	2.41	1.005
Q7.34 MANAGEMENT VISION AND PRIORITIES	85	1	4	2.39	1.036
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	83	1	4	2.39	1.080
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	79	1	4	2.34	1.049
Q7.15 PROJECTS TOO SMALL AND DISPERSED	73	1	4	2.21	.897
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	73	1	4	2.21	1.013
Q7.21 LONGER PROCESSES FOR PERMITTING	70	1	4	2.17	.978
Q7.29 INTERVENTION BY ELECTED OFFICIALS	70	1	4	2.16	.942
Q7.39 INSUFFICIENT MANDATE FOR LID	76	1	4	2.14	1.080
Q7.10 AESTHETICS	79	1	4	2.13	.853
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	77	1	4	1.92	.807

Q7.38 SPILL AND POLLUTION PREVENTION	75	1	4	1.92	.850
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	54	1	4	1.89	.904
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	72	1	4	1.76	.778
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	69	1	4	1.67	.816

*Table 8.17 Descriptive Statistics for Barriers: Both Phase I and Phase II NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	121	1	4	3.21	.903
Q7.03 MAINTENANCE AND DURABILITY	122	1	4	3.17	.810
Q7.01 SOIL SUITABILITY FOR INFILTRATION	127	1	4	3.10	.834
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	123	1	4	3.07	.889
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	107	1	4	3.02	.942
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	114	1	4	2.98	.941
Q7.05 INSUFFICIENT MUNICIPAL STAFF	120	1	4	2.98	1.016
Q7.04 PROJECT COST	118	1	4	2.95	.895
Q7.17 PROPERTY RIGHTS CONCERNS	113	1	4	2.73	1.020
Q7.22 LACK OF PUBLIC DEMAND	108	1	4	2.69	1.001
Q7.07 RISK/LIABILITY	103	1	4	2.68	.952
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	120	1	4	2.68	.989
Q7.06 STAFF NEED MORE TRAINING	125	1	4	2.66	1.000
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	115	1	4	2.63	.932
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	122	1	4	2.56	1.061
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	98	1	4	2.55	.898
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	115	1	4	2.54	.930
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	91	1	4	2.53	.947
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	93	1	4	2.53	1.006
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	106	1	4	2.51	1.071
Q7.34 MANAGEMENT VISION AND PRIORITIES	124	1	4	2.51	1.055
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	118	1	4	2.50	.931
Q7.36 LACK OF AVAILABLE SPACE	122	1	4	2.49	1.014
Q7.19 INSUFFICIENT IMPACT FEES	88	1	4	2.49	1.072
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	117	1	4	2.48	.952
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	119	1	4	2.46	1.064
Q7.24 PUBLIC RESISTANCE	106	1	4	2.45	.977
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	108	1	4	2.35	.889
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	110	1	4	2.24	1.022
Q7.21 LONGER PROCESSES FOR PERMITTING	106	1	4	2.24	1.000

Q7.10 AESTHETICS	119	1	4	2.21	.882
Q7.39 INSUFFICIENT MANDATE FOR LID	116	1	4	2.21	1.051
Q7.15 PROJECTS TOO SMALL AND DISPERSED	113	1	4	2.20	.918
Q7.29 INTERVENTION BY ELECTED OFFICIALS	102	1	4	2.16	.982
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	78	1	4	2.04	.986
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	116	1	4	2.00	.834
Q7.38 SPILL AND POLLUTION PREVENTION	113	1	4	1.91	.861
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	111	1	4	1.77	.809
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	96	1	4	1.69	.786

*Table 8.18 Descriptive Statistics for Barriers: Non- NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.05 INSUFFICIENT MUNICIPAL STAFF	16	1	4	3.25	1.065
Q7.04 PROJECT COST	15	1	4	3.20	.862
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	15	1	4	3.13	.915
Q7.06 STAFF NEED MORE TRAINING	15	1	4	3.13	.990
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	17	1	4	3.06	1.029
Q7.17 PROPERTY RIGHTS CONCERNS	12	1	4	3.00	.853
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	14	1	4	2.93	.730
Q7.03 MAINTENANCE AND DURABILITY	14	2	4	2.93	.616
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	16	1	4	2.88	.806
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	14	1	4	2.86	.949
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	13	1	4	2.85	1.144
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	13	2	4	2.77	.725
Q7.07 RISK/LIABILITY	13	1	4	2.77	.832
Q7.22 LACK OF PUBLIC DEMAND	15	1	4	2.73	.799
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	14	1	4	2.71	.914
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	15	1	4	2.67	1.175
Q7.34 MANAGEMENT VISION AND PRIORITIES	15	1	4	2.60	1.056
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	13	1	4	2.54	.877
Q7.36 LACK OF AVAILABLE SPACE	15	1	4	2.53	.834
Q7.24 PUBLIC RESISTANCE	15	1	4	2.53	.990
Q7.39 INSUFFICIENT MANDATE FOR LID	14	1	4	2.50	1.019
Q7.15 PROJECTS TOO SMALL AND DISPERSED	12	1	4	2.50	.905
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	12	1	3	2.50	.674
Q7.01 SOIL SUITABILITY FOR INFILTRATION	14	1	4	2.50	1.019
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	12	1	4	2.50	.798

Q7.19 INSUFFICIENT IMPACT FEES	13	1	4	2.46	1.050
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	16	1	4	2.44	.892
Q7.29 INTERVENTION BY ELECTED OFFICIALS	15	1	4	2.40	.910
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	13	1	4	2.38	.870
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	11	1	4	2.36	.924
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	13	1	4	2.31	.947
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	12	1	4	2.25	.866
Q7.10 AESTHETICS	15	1	4	2.20	1.014
Q7.21 LONGER PROCESSES FOR PERMITTING	15	1	4	2.20	1.146
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	13	1	4	2.15	.899
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	15	1	4	2.13	.990
Q7.38 SPILL AND POLLUTION PREVENTION	11	1	3	2.09	.831
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	11	1	3	2.00	.447
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	11	1	4	1.73	1.009

**Research Question 10: How do perceptions of barriers vary between executive staff, middle managers, and line staff?**

**Q7. Rate the relative frequency of the following barriers as they apply to green infrastructure projects in your jurisdiction.**

- 1 – Not a Barrier
- 2 – Infrequent Barrier
- 3 – Common Barrier
- 4 – Persistent Barrier

**Q11. Which of the following best describes your role at your respective municipality?**

- 1 – Executive Staff
- 2 – Middle Management
- 3 – Line Staff
- 4 – Not a Municipal Employee

*Table 8.19 Descriptive Statistics for Barriers: Executive Staff*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	24	2	4	3.37	.651
Q7.05 INSUFFICIENT MUNICIPAL STAFF	25	1	4	3.19	.871

Q7.03 MAINTENANCE AND DURABILITY	22	2	4	3.16	.674
Q7.04 PROJECT COST	25	1	4	3.09	.842
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	23	1	4	3.05	.854
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	22	1	4	2.97	.921
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	23	2	4	2.96	.746
Q7.17 PROPERTY RIGHTS CONCERNS	24	2	4	2.93	.638
Q7.01 SOIL SUITABILITY FOR INFILTRATION	22	1	4	2.92	1.093
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	24	1	4	2.72	.796
Q7.06 STAFF NEED MORE TRAINING	25	1	4	2.70	.790
Q7.22 LACK OF PUBLIC DEMAND	24	1	4	2.67	.755
Q7.07 RISK/LIABILITY	21	2	4	2.67	.727
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	24	1	4	2.66	.704
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	22	1	4	2.61	.755
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	23	2	4	2.57	.725
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	25	1	4	2.56	.852
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	26	1	4	2.52	.940
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	22	1	4	2.51	.853
Q7.36 LACK OF AVAILABLE SPACE	24	1	4	2.48	.875
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	23	1	4	2.47	.735
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	23	1	4	2.44	.724
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	19	1	4	2.44	.869
Q7.19 INSUFFICIENT IMPACT FEES	22	1	4	2.41	.942
Q7.24 PUBLIC RESISTANCE	25	1	4	2.40	.999
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	25	1	4	2.37	.857
Q7.15 PROJECTS TOO SMALL AND DISPERSED	22	1	4	2.34	.913
Q7.34 MANAGEMENT VISION AND PRIORITIES	25	1	4	2.33	.850
Q7.21 LONGER PROCESSES FOR PERMITTING	23	1	4	2.33	.944
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	21	1	4	2.30	.697
Q7.29 INTERVENTION BY ELECTED OFFICIALS	24	1	4	2.23	.906
Q7.39 INSUFFICIENT MANDATE FOR LID	23	1	4	2.21	.905
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	26	1	4	2.20	.895
Q7.10 AESTHETICS	25	1	4	2.16	.944
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	23	1	4	2.06	.800
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	24	1	4	2.02	.854
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	23	1	3	1.86	.548
Q7.38 SPILL AND POLLUTION PREVENTION	23	1	4	1.77	.717
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	20	1	3	1.68	.557

*Table 8.20 Descriptive Statistics for Barriers: Middle Management*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	35	1	4	3.09	.919
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	37	1	4	3.08	.924
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	38	1	4	3.03	.972
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	40	1	4	3.03	.891
Q7.04 PROJECT COST	37	1	4	3.00	.943
Q7.03 MAINTENANCE AND DURABILITY	36	1	4	2.97	.845
Q7.01 SOIL SUITABILITY FOR INFILTRATION	40	1	4	2.95	.904
Q7.05 INSUFFICIENT MUNICIPAL STAFF	38	1	4	2.74	1.057
Q7.07 RISK/LIABILITY	31	1	4	2.65	1.018
Q7.17 PROPERTY RIGHTS CONCERNS	37	1	4	2.63	1.033
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	37	1	4	2.62	1.010
Q7.22 LACK OF PUBLIC DEMAND	35	1	4	2.60	.914
Q7.06 STAFF NEED MORE TRAINING	37	1	4	2.54	.900
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	28	1	4	2.53	.927
Q7.36 LACK OF AVAILABLE SPACE	40	1	4	2.53	.960
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	37	1	4	2.51	.837
Q7.24 PUBLIC RESISTANCE	35	1	4	2.49	.919
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	29	1	4	2.45	1.088
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	35	1	4	2.43	.884
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	34	1	4	2.41	.857
Q7.19 INSUFFICIENT IMPACT FEES	28	1	4	2.39	1.066
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	28	1	4	2.36	.826
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	39	1	4	2.33	.982
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	38	1	4	2.29	1.063
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	36	1	4	2.26	.905
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	34	1	4	2.24	.923
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	35	1	4	2.23	1.060
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	33	1	4	2.15	1.035
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	36	1	4	2.11	.820
Q7.34 MANAGEMENT VISION AND PRIORITIES	40	1	4	2.10	1.033
Q7.21 LONGER PROCESSES FOR PERMITTING	33	1	4	2.09	.980
Q7.10 AESTHETICS	37	1	4	2.08	.829
Q7.29 INTERVENTION BY ELECTED OFFICIALS	36	1	4	2.00	.926
Q7.39 INSUFFICIENT MANDATE FOR LID	37	1	4	1.97	.986
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	24	1	4	1.88	.900

Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	36	1	4	1.86	.867
Q7.15 PROJECTS TOO SMALL AND DISPERSED	34	1	3	1.82	.626
Q7.38 SPILL AND POLLUTION PREVENTION	36	1	4	1.81	.879
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	29	1	4	1.52	.785

*Table 8.21 Descriptive Statistics for Barriers: Line Staff*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.03 MAINTENANCE AND DURABILITY	67	1	4	3.26	.774
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	65	1	4	3.21	.894
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	65	1	4	3.14	.799
Q7.01 SOIL SUITABILITY FOR INFILTRATION	68	1	4	3.07	.781
Q7.04 PROJECT COST	63	1	4	3.03	.816
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	55	1	4	2.99	.924
Q7.05 INSUFFICIENT MUNICIPAL STAFF	66	1	4	2.95	1.045
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	60	1	4	2.90	1.049
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	65	1	4	2.87	.979
Q7.06 STAFF NEED MORE TRAINING	69	1	4	2.83	1.052
Q7.34 MANAGEMENT VISION AND PRIORITIES	64	1	4	2.83	.965
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	63	1	4	2.80	.999
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	60	1	4	2.72	1.008
Q7.07 RISK/LIABILITY	53	1	4	2.72	.947
Q7.22 LACK OF PUBLIC DEMAND	56	1	4	2.72	.965
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	62	1	4	2.70	1.121
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	54	1	4	2.68	.887
Q7.17 PROPERTY RIGHTS CONCERNS	58	1	4	2.64	1.052
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	57	1	4	2.63	1.079
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	65	1	4	2.60	1.008
Q7.19 INSUFFICIENT IMPACT FEES	43	1	4	2.59	1.015
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	62	1	4	2.57	.914
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	50	1	4	2.55	1.039
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	58	1	4	2.54	.840
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	50	1	4	2.53	.980
Q7.24 PUBLIC RESISTANCE	59	1	4	2.49	.953
Q7.39 INSUFFICIENT MANDATE FOR LID	57	1	4	2.47	1.055
Q7.15 PROJECTS TOO SMALL AND DISPERSED	59	1	4	2.45	1.009
Q7.36 LACK OF AVAILABLE SPACE	65	1	4	2.41	.995
Q7.10 AESTHETICS	64	1	4	2.41	.904



Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	56	1	4	2.35	.984
Q7.21 LONGER PROCESSES FOR PERMITTING	55	1	4	2.32	1.041
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	56	1	4	2.28	1.040
Q7.29 INTERVENTION BY ELECTED OFFICIALS	55	1	4	2.28	.943
Q7.38 SPILL AND POLLUTION PREVENTION	60	1	4	2.05	.940
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	60	1	4	2.05	.813
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	41	1	4	2.04	1.001
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	56	1	4	1.76	.848
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	47	1	4	1.71	.852

*Table 8.22 Descriptive Statistics for Barriers: Not a Municipal Employee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.05 INSUFFICIENT MUNICIPAL STAFF	1	4	4	4.00	.
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	3	3	4	3.67	.577
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	3	3	4	3.67	.577
Q7.17 PROPERTY RIGHTS CONCERNS	3	3	4	3.67	.577
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	2	3	4	3.50	.707
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	2	3	4	3.50	.707
Q7.24 PUBLIC RESISTANCE	2	3	4	3.50	.707
Q7.22 LACK OF PUBLIC DEMAND	2	3	4	3.50	.707
Q7.01 SOIL SUITABILITY FOR INFILTRATION	2	3	4	3.50	.707
Q7.36 LACK OF AVAILABLE SPACE	3	3	4	3.33	.577
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	3	2	4	3.33	1.155
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	3	3	4	3.33	.577
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	3	2	4	3.33	1.155
Q7.39 INSUFFICIENT MANDATE FOR LID	3	3	3	3.00	.000
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	3	2	4	3.00	1.000
Q7.34 MANAGEMENT VISION AND PRIORITIES	3	3	3	3.00	.000
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	3	3	3	3.00	.000
Q7.29 INTERVENTION BY ELECTED OFFICIALS	2	2	4	3.00	1.414
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	2	2	4	3.00	1.414
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	3	2	4	3.00	1.000
Q7.21 LONGER PROCESSES FOR PERMITTING	2	2	4	3.00	1.414
Q7.19 INSUFFICIENT IMPACT FEES	2	3	3	3.00	.000
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	2	2	4	3.00	1.414
Q7.15 PROJECTS TOO SMALL AND DISPERSED	3	3	3	3.00	.000
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	2	3	3	3.00	.000

Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	1	3	3	3.00	.
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	3	3	3	3.00	.000
Q7.07 RISK/LIABILITY	3	2	4	3.00	1.000
Q7.03 MAINTENANCE AND DURABILITY	3	2	4	3.00	1.000
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	3	2	3	2.67	.577
Q7.10 AESTHETICS	3	2	3	2.67	.577
Q7.06 STAFF NEED MORE TRAINING	3	2	3	2.67	.577
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	2	2	3	2.50	.707
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	3	2	3	2.33	.577
Q7.04 PROJECT COST	3	2	3	2.33	.577
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	3	2	3	2.26	.655
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	1	2	2	2.00	.
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	3	2	2	2.00	.000
Q7.38 SPILL AND POLLUTION PREVENTION	3	1	2	1.67	.577

*Table 8.23 Descriptive Statistics for Barriers: Planning*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	41	1	4	3.17	.863
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	36	1	4	3.06	.878
Q7.04 PROJECT COST	39	1	4	3.02	.922
Q7.03 MAINTENANCE AND DURABILITY	37	1	4	2.99	.747
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	37	1	4	2.96	.899
Q7.05 INSUFFICIENT MUNICIPAL STAFF	42	1	4	2.86	1.049
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	35	1	4	2.86	1.055
Q7.01 SOIL SUITABILITY FOR INFILTRATION	41	1	4	2.84	.989
Q7.07 RISK/LIABILITY	32	1	4	2.72	.923
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	37	1	4	2.68	.997
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	32	1	4	2.61	.805
Q7.06 STAFF NEED MORE TRAINING	40	1	4	2.60	1.033
Q7.17 PROPERTY RIGHTS CONCERNS	36	1	4	2.58	1.025
Q7.22 LACK OF PUBLIC DEMAND	37	1	4	2.54	.900
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	38	1	4	2.50	.952
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	43	1	4	2.48	1.073
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	37	1	4	2.47	.926
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	37	1	4	2.45	.968
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	39	1	4	2.44	1.046
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	39	1	4	2.42	.847

Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	36	1	4	2.39	.838
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	39	1	4	2.33	.898
Q7.36 LACK OF AVAILABLE SPACE	42	1	4	2.30	.968
Q7.34 MANAGEMENT VISION AND PRIORITIES	42	1	4	2.29	.970
Q7.19 INSUFFICIENT IMPACT FEES	30	1	4	2.28	.998
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	40	1	4	2.28	1.037
Q7.39 INSUFFICIENT MANDATE FOR LID	36	1	4	2.27	.976
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	33	1	4	2.20	.863
Q7.24 PUBLIC RESISTANCE	37	1	4	2.19	.811
Q7.10 AESTHETICS	40	1	4	2.10	.955
Q7.21 LONGER PROCESSES FOR PERMITTING	37	1	4	2.10	.968
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	25	1	4	2.09	.943
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	34	1	4	2.09	.900
Q7.15 PROJECTS TOO SMALL AND DISPERSED	37	1	4	2.02	.929
Q7.38 SPILL AND POLLUTION PREVENTION	35	1	4	1.97	.882
Q7.29 INTERVENTION BY ELECTED OFFICIALS	36	1	4	1.94	.826
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	36	1	4	1.94	.852
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	40	1	3	1.83	.747
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	32	1	3	1.61	.743

*Table 8.24 Descriptive Statistics for Barriers: Permitting*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	41	1	4	3.22	.853
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	37	1	4	3.10	.933
Q7.03 MAINTENANCE AND DURABILITY	38	1	4	3.07	.752
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	38	1	4	3.04	.872
Q7.04 PROJECT COST	41	1	4	3.01	.939
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	36	1	4	3.00	.919
Q7.01 SOIL SUITABILITY FOR INFILTRATION	42	1	4	2.96	.976
Q7.07 RISK/LIABILITY	33	1	4	2.88	.856
Q7.17 PROPERTY RIGHTS CONCERNS	37	1	4	2.78	.854
Q7.05 INSUFFICIENT MUNICIPAL STAFF	41	1	4	2.76	1.044
Q7.06 STAFF NEED MORE TRAINING	41	1	4	2.68	.986
Q7.22 LACK OF PUBLIC DEMAND	37	1	4	2.59	.865
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	34	1	4	2.58	.867
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	40	1	4	2.58	.903

Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	39	1	4	2.57	.936
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	39	1	4	2.56	.904
Q7.36 LACK OF AVAILABLE SPACE	42	1	4	2.49	.938
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	36	1	4	2.47	.845
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	41	1	4	2.45	.997
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	41	1	4	2.42	.863
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	33	1	4	2.41	1.009
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	36	1	4	2.36	.990
Q7.19 INSUFFICIENT IMPACT FEES	32	1	4	2.35	.919
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	38	1	4	2.34	1.021
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	38	1	4	2.32	.904
Q7.39 INSUFFICIENT MANDATE FOR LID	39	1	4	2.28	1.000
Q7.34 MANAGEMENT VISION AND PRIORITIES	42	1	4	2.26	.912
Q7.24 PUBLIC RESISTANCE	37	1	4	2.24	.895
Q7.15 PROJECTS TOO SMALL AND DISPERSED	37	1	4	2.21	.920
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	26	1	4	2.20	.883
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	35	1	4	2.16	.790
Q7.10 AESTHETICS	40	1	4	2.13	.911
Q7.21 LONGER PROCESSES FOR PERMITTING	37	1	4	2.07	1.066
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	33	1	4	2.03	.918
Q7.29 INTERVENTION BY ELECTED OFFICIALS	37	1	4	2.00	.850
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	37	1	3	1.95	.743
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	35	1	4	1.94	.898
Q7.38 SPILL AND POLLUTION PREVENTION	37	1	4	1.94	.770
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	32	1	3	1.76	.751

*Table 8.25 Descriptive Statistics for Barriers: Engineering*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.03 MAINTENANCE AND DURABILITY	60	1	4	3.23	.793
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	58	1	4	3.21	.969
Q7.01 SOIL SUITABILITY FOR INFILTRATION	62	1	4	3.18	.810
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	61	1	4	3.07	.865
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	56	1	4	3.03	.931
Q7.04 PROJECT COST	60	1	4	3.01	.876
Q7.05 INSUFFICIENT MUNICIPAL STAFF	60	1	4	2.98	1.081
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	56	1	4	2.96	.967
Q7.22 LACK OF PUBLIC DEMAND	54	1	4	2.87	.870

Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	57	1	4	2.75	1.005
Q7.06 STAFF NEED MORE TRAINING	60	1	4	2.74	.985
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	57	1	4	2.68	.869
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	60	1	4	2.68	1.033
Q7.07 RISK/LIABILITY	51	1	4	2.67	.886
Q7.36 LACK OF AVAILABLE SPACE	62	1	4	2.65	1.005
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	44	1	4	2.63	1.088
Q7.17 PROPERTY RIGHTS CONCERNS	56	1	4	2.63	.945
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	58	1	4	2.62	.788
Q7.34 MANAGEMENT VISION AND PRIORITIES	59	1	4	2.59	1.019
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	59	1	4	2.50	.968
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	52	1	4	2.48	1.019
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	45	1	4	2.46	.996
Q7.24 PUBLIC RESISTANCE	57	1	4	2.46	.983
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	46	1	4	2.46	.836
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	58	1	4	2.44	.973
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	58	1	4	2.40	.876
Q7.19 INSUFFICIENT IMPACT FEES	45	1	4	2.39	.995
Q7.10 AESTHETICS	60	1	4	2.33	.933
Q7.39 INSUFFICIENT MANDATE FOR LID	57	1	4	2.30	1.069
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	54	1	4	2.25	.877
Q7.29 INTERVENTION BY ELECTED OFFICIALS	56	1	4	2.19	.925
Q7.21 LONGER PROCESSES FOR PERMITTING	53	1	4	2.16	.958
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	52	1	4	2.12	1.022
Q7.15 PROJECTS TOO SMALL AND DISPERSED	56	1	4	2.10	.909
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	36	1	4	1.95	.853
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	54	1	4	1.91	.784
Q7.38 SPILL AND POLLUTION PREVENTION	57	1	4	1.81	.842
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	57	1	4	1.72	.768
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	47	1	4	1.71	.742

*Table 8.26 Descriptive Statistics for Barriers: Public Works*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	79	1	4	3.33	.782
Q7.03 MAINTENANCE AND DURABILITY	77	1	4	3.24	.767
Q7.04 PROJECT COST	77	1	4	3.08	.817
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	76	1	4	3.05	.841

Q7.01 SOIL SUITABILITY FOR INFILTRATION	81	1	4	3.05	.750
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	71	1	4	3.03	.977
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	69	1	4	3.02	.940
Q7.05 INSUFFICIENT MUNICIPAL STAFF	79	1	4	2.99	1.019
Q7.06 STAFF NEED MORE TRAINING	79	1	4	2.75	.937
Q7.22 LACK OF PUBLIC DEMAND	71	1	4	2.75	.906
Q7.07 RISK/LIABILITY	64	1	4	2.70	.919
Q7.17 PROPERTY RIGHTS CONCERNS	70	1	4	2.69	.923
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	76	1	4	2.68	.969
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	75	1	4	2.65	.902
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	78	1	4	2.65	1.028
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	62	1	4	2.64	.871
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	57	1	4	2.64	1.086
Q7.34 MANAGEMENT VISION AND PRIORITIES	78	1	4	2.59	1.012
Q7.36 LACK OF AVAILABLE SPACE	79	1	4	2.58	.898
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	77	1	4	2.57	1.031
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	72	1	4	2.56	.818
Q7.19 INSUFFICIENT IMPACT FEES	56	1	4	2.55	1.019
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	73	1	4	2.55	.867
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	60	1	4	2.50	.991
Q7.24 PUBLIC RESISTANCE	72	1	4	2.50	.934
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	67	1	4	2.49	1.078
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	72	1	4	2.49	.886
Q7.10 AESTHETICS	77	1	4	2.29	.958
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	67	1	4	2.25	.991
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	65	1	4	2.25	.858
Q7.39 INSUFFICIENT MANDATE FOR LID	71	1	4	2.25	1.039
Q7.21 LONGER PROCESSES FOR PERMITTING	68	1	4	2.24	1.044
Q7.29 INTERVENTION BY ELECTED OFFICIALS	68	1	4	2.24	.988
Q7.15 PROJECTS TOO SMALL AND DISPERSED	69	1	4	2.17	.859
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	71	1	4	2.08	.806
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	51	1	4	2.00	.819
Q7.38 SPILL AND POLLUTION PREVENTION	73	1	4	1.85	.867
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	67	1	4	1.69	.733
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	57	1	4	1.64	.763

*Table 8.27 Descriptive Statistics for Barriers: Surface Water Management*

Item	N	Minimum	Maximum	Mean	Std. Deviation
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Q7.03 MAINTENANCE AND DURABILITY	70	1	4	3.22	.709
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	71	1	4	3.20	.936
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	72	1	4	3.13	.848
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	66	1	4	3.01	.983
Q7.05 INSUFFICIENT MUNICIPAL STAFF	70	1	4	2.99	1.042
Q7.01 SOIL SUITABILITY FOR INFILTRATION	73	1	4	2.98	.875
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	62	1	4	2.96	.953
Q7.04 PROJECT COST	70	1	4	2.89	.920
Q7.06 STAFF NEED MORE TRAINING	73	1	4	2.77	.979
Q7.22 LACK OF PUBLIC DEMAND	60	1	4	2.73	.899
Q7.17 PROPERTY RIGHTS CONCERNS	65	1	4	2.66	.989
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	67	1	4	2.63	1.009
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	72	1	4	2.63	1.013
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	71	1	4	2.62	1.019
Q7.07 RISK/LIABILITY	59	1	4	2.61	.928
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	49	1	4	2.60	1.067
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	68	1	4	2.56	1.006
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	57	1	4	2.56	1.017
Q7.24 PUBLIC RESISTANCE	63	1	4	2.54	.947
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	69	1	4	2.54	.901
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	65	1	4	2.50	.918
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	53	1	4	2.45	.911
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	67	1	4	2.45	.940
Q7.34 MANAGEMENT VISION AND PRIORITIES	72	1	4	2.44	1.005
Q7.19 INSUFFICIENT IMPACT FEES	46	1	4	2.44	1.039
Q7.36 LACK OF AVAILABLE SPACE	71	1	4	2.43	.918
Q7.10 AESTHETICS	69	1	4	2.32	.915
Q7.15 PROJECTS TOO SMALL AND DISPERSED	61	1	4	2.30	.889
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	49	1	4	2.29	.923
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	61	1	4	2.28	.985
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	62	1	4	2.23	.904
Q7.21 LONGER PROCESSES FOR PERMITTING	60	1	4	2.21	1.029
Q7.39 INSUFFICIENT MANDATE FOR LID	68	1	4	2.16	.987
Q7.29 INTERVENTION BY ELECTED OFFICIALS	61	1	4	2.14	1.016
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	43	1	4	2.09	.947
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	66	1	4	2.02	.794
Q7.38 SPILL AND POLLUTION PREVENTION	64	1	4	1.88	.889
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	58	1	4	1.72	.830

Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	64	1	4	1.69	.764
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*Table 8.28 Descriptive Statistics for Barriers: Community Development*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	25	1	4	3.28	.792
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	21	2	4	3.02	.811
Q7.04 PROJECT COST	23	1	4	3.01	.885
Q7.05 INSUFFICIENT MUNICIPAL STAFF	26	1	4	2.96	1.076
Q7.17 PROPERTY RIGHTS CONCERNS	23	1	4	2.91	.900
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	22	1	4	2.91	1.009
Q7.03 MAINTENANCE AND DURABILITY	21	2	4	2.88	.701
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	22	1	4	2.85	.933
Q7.01 SOIL SUITABILITY FOR INFILTRATION	25	1	4	2.78	.956
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	21	1	4	2.77	.986
Q7.22 LACK OF PUBLIC DEMAND	23	1	4	2.65	.935
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	23	1	4	2.65	.982
Q7.07 RISK/LIABILITY	19	1	4	2.63	.829
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	23	1	4	2.59	.934
Q7.06 STAFF NEED MORE TRAINING	25	1	4	2.52	1.005
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	20	1	4	2.43	.839
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	24	1	4	2.43	.826
Q7.36 LACK OF AVAILABLE SPACE	26	1	4	2.37	.973
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	23	1	4	2.35	.832
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	22	1	4	2.34	.965
Q7.39 INSUFFICIENT MANDATE FOR LID	21	1	4	2.33	1.067
Q7.19 INSUFFICIENT IMPACT FEES	21	1	4	2.30	1.079
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	24	1	4	2.29	.999
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	26	1	4	2.29	1.038
Q7.34 MANAGEMENT VISION AND PRIORITIES	25	1	4	2.28	.980
Q7.24 PUBLIC RESISTANCE	22	1	4	2.27	.827
Q7.15 PROJECTS TOO SMALL AND DISPERSED	22	1	4	2.21	1.025
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	25	1	4	2.16	.943
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	20	1	4	2.13	.680
Q7.21 LONGER PROCESSES FOR PERMITTING	23	1	4	2.07	1.000
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	20	1	4	2.05	.931
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	25	1	4	2.04	1.136
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	13	1	3	2.00	.707



Q7.29 INTERVENTION BY ELECTED OFFICIALS	22	1	4	2.00	.873
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	19	1	3	1.89	.737
Q7.10 AESTHETICS	24	1	4	1.88	.900
Q7.38 SPILL AND POLLUTION PREVENTION	22	1	3	1.72	.681
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	23	1	3	1.70	.635
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	23	1	3	1.59	.643

*Table 8.29 Descriptive Statistics for Barriers: Parks*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.05 INSUFFICIENT MUNICIPAL STAFF	19	2	4	3.41	.705
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	17	2	4	3.40	.624
Q7.04 PROJECT COST	18	2	4	3.22	.617
Q7.03 MAINTENANCE AND DURABILITY	17	2	4	3.19	.589
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	16	2	4	3.12	.678
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	17	1	4	3.05	.877
Q7.06 STAFF NEED MORE TRAINING	18	2	4	2.97	.694
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	19	1	4	2.92	.759
Q7.01 SOIL SUITABILITY FOR INFILTRATION	18	1	4	2.90	.876
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	18	2	4	2.86	.681
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	18	2	4	2.78	.611
Q7.17 PROPERTY RIGHTS CONCERNS	16	1	4	2.71	.688
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	17	2	4	2.66	.692
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	19	1	4	2.65	.749
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	15	1	4	2.60	.739
Q7.34 MANAGEMENT VISION AND PRIORITIES	19	1	4	2.59	.759
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	18	1	4	2.58	.768
Q7.24 PUBLIC RESISTANCE	15	2	4	2.54	.638
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	17	1	4	2.54	.871
Q7.22 LACK OF PUBLIC DEMAND	17	1	4	2.53	.800
Q7.29 INTERVENTION BY ELECTED OFFICIALS	15	1	4	2.52	.760
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	19	1	4	2.51	.822
Q7.07 RISK/LIABILITY	16	2	4	2.51	.628
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	19	1	4	2.50	.953
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	16	1	4	2.49	.876
Q7.39 INSUFFICIENT MANDATE FOR LID	17	1	4	2.45	.884
Q7.10 AESTHETICS	18	1	4	2.44	.923
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	16	1	4	2.37	.724

Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	14	1	4	2.30	.780
Q7.19 INSUFFICIENT IMPACT FEES	13	1	4	2.28	.835
Q7.36 LACK OF AVAILABLE SPACE	19	1	4	2.20	.832
Q7.21 LONGER PROCESSES FOR PERMITTING	17	1	4	2.20	.918
Q7.15 PROJECTS TOO SMALL AND DISPERSED	15	1	3	2.16	.694
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	11	1	3	2.05	.715
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	16	1	4	1.94	.738
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	16	1	3	1.92	.576
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	17	1	4	1.88	.962
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	13	1	3	1.83	.659
Q7.38 SPILL AND POLLUTION PREVENTION	17	1	4	1.76	.785

*Table 8.30 Descriptive Statistics for Barriers: Maintenance*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.03 MAINTENANCE AND DURABILITY	24	2	4	3.19	.599
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	24	1	4	3.10	.899
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	26	1	4	3.07	.892
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	26	1	4	3.06	.784
Q7.05 INSUFFICIENT MUNICIPAL STAFF	25	1	4	3.04	.978
Q7.04 PROJECT COST	27	1	4	3.04	.688
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	25	1	4	3.00	.798
Q7.01 SOIL SUITABILITY FOR INFILTRATION	26	1	4	2.90	.978
Q7.06 STAFF NEED MORE TRAINING	26	1	4	2.85	.834
Q7.22 LACK OF PUBLIC DEMAND	23	1	4	2.78	.736
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	25	1	4	2.76	.970
Q7.17 PROPERTY RIGHTS CONCERNS	25	1	4	2.76	.779
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	26	1	4	2.70	.962
Q7.07 RISK/LIABILITY	20	2	4	2.65	.742
Q7.29 INTERVENTION BY ELECTED OFFICIALS	20	1	4	2.60	.940
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	24	1	4	2.59	.927
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	27	1	4	2.57	.837
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	26	1	4	2.54	.761
Q7.34 MANAGEMENT VISION AND PRIORITIES	28	1	4	2.54	.922
Q7.24 PUBLIC RESISTANCE	23	1	4	2.52	.947
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	25	1	4	2.52	1.005
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	21	1	4	2.45	.834
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	21	1	4	2.44	.951

Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	25	1	4	2.44	.944
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	25	1	4	2.41	.812
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	23	1	4	2.39	.941
Q7.19 INSUFFICIENT IMPACT FEES	18	1	4	2.39	1.017
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	21	1	4	2.38	.921
Q7.10 AESTHETICS	25	1	4	2.36	.810
Q7.36 LACK OF AVAILABLE SPACE	26	1	4	2.33	.880
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	14	1	4	2.29	.994
Q7.21 LONGER PROCESSES FOR PERMITTING	23	1	4	2.24	.971
Q7.39 INSUFFICIENT MANDATE FOR LID	26	1	4	2.15	.836
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	24	1	4	2.00	.834
Q7.15 PROJECTS TOO SMALL AND DISPERSED	21	1	4	1.98	.896
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	25	1	4	1.97	.869
Q7.38 SPILL AND POLLUTION PREVENTION	24	1	4	1.89	.917
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	19	1	3	1.77	.704
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	25	1	4	1.70	.925

*Table 8.31 Descriptive Statistics for Barriers: Airport*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	4	3	4	3.50	.577
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	4	3	4	3.50	.577
Q7.05 INSUFFICIENT MUNICIPAL STAFF	4	2	4	3.50	1.000
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	4	3	4	3.43	.674
Q7.21 LONGER PROCESSES FOR PERMITTING	3	2	4	3.26	1.280
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	4	2	4	3.25	.957
Q7.04 PROJECT COST	4	2	4	3.16	1.002
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	3	2	4	3.16	.775
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	4	2	4	3.06	1.087
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	4	2	4	3.03	1.117
Q7.07 RISK/LIABILITY	4	2	4	3.01	.807
Q7.17 PROPERTY RIGHTS CONCERNS	3	2	4	3.00	1.000
Q7.03 MAINTENANCE AND DURABILITY	4	2	4	2.94	.825
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	4	2	4	2.85	.871
Q7.29 INTERVENTION BY ELECTED OFFICIALS	3	2	3	2.67	.577
Q7.22 LACK OF PUBLIC DEMAND	3	2	4	2.67	1.155
Q7.06 STAFF NEED MORE TRAINING	3	2	3	2.67	.577
Q7.39 INSUFFICIENT MANDATE FOR LID	3	2	4	2.64	1.176

Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	4	1	4	2.62	1.114
Q7.36 LACK OF AVAILABLE SPACE	4	2	4	2.56	.965
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	4	2	4	2.56	.965
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	4	2	3	2.53	.550
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	4	2	4	2.51	.996
Q7.34 MANAGEMENT VISION AND PRIORITIES	4	2	3	2.50	.577
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	2	2	3	2.50	.707
Q7.10 AESTHETICS	4	1	4	2.50	1.291
Q7.01 SOIL SUITABILITY FOR INFILTRATION	4	1	4	2.43	1.263
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	2	2	3	2.40	.850
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	3	2	3	2.33	.577
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	3	2	3	2.33	.577
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	3	2	3	2.33	.577
Q7.15 PROJECTS TOO SMALL AND DISPERSED	3	2	3	2.28	.631
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	3	2	3	2.25	.659
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	3	1	3	2.06	.905
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	2	2	2	2.00	.000
Q7.19 INSUFFICIENT IMPACT FEES	3	1	3	1.89	1.017
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	2	2	2	1.88	.165
Q7.38 SPILL AND POLLUTION PREVENTION	4	1	2	1.55	.412
Q7.24 PUBLIC RESISTANCE	2	1	2	1.50	.707

*Table 8.32 Descriptive Statistics for Barriers: Education and Outreach*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.05 INSUFFICIENT MUNICIPAL STAFF	30	1	4	3.33	.802
Q7.03 MAINTENANCE AND DURABILITY	29	2	4	3.23	.582
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	29	1	4	3.16	.809
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	28	1	4	3.14	.844
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	30	1	4	3.10	.924
Q7.01 SOIL SUITABILITY FOR INFILTRATION	30	1	4	3.06	.946
Q7.04 PROJECT COST	30	1	4	3.04	.792
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	27	1	4	2.91	1.001
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	30	1	4	2.83	.986
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	24	1	4	2.79	1.020
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	25	1	4	2.79	.967
Q7.06 STAFF NEED MORE TRAINING	31	1	4	2.77	1.023
Q7.07 RISK/LIABILITY	20	1	4	2.75	.715

Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	28	1	4	2.75	.887
Q7.22 LACK OF PUBLIC DEMAND	27	1	4	2.74	.859
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	30	1	4	2.71	.910
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	30	1	4	2.70	1.088
Q7.17 PROPERTY RIGHTS CONCERNS	27	1	4	2.67	.920
Q7.34 MANAGEMENT VISION AND PRIORITIES	30	1	4	2.63	.964
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	25	1	4	2.61	.954
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	27	1	4	2.56	.932
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	29	1	4	2.48	.829
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	26	1	4	2.47	.901
Q7.19 INSUFFICIENT IMPACT FEES	21	1	4	2.41	.881
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	25	1	4	2.39	.822
Q7.39 INSUFFICIENT MANDATE FOR LID	26	1	4	2.38	.984
Q7.29 INTERVENTION BY ELECTED OFFICIALS	26	1	4	2.35	1.018
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	24	1	4	2.33	1.007
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	18	1	4	2.28	1.018
Q7.24 PUBLIC RESISTANCE	27	1	4	2.26	.813
Q7.36 LACK OF AVAILABLE SPACE	29	1	4	2.22	1.013
Q7.10 AESTHETICS	30	1	4	2.20	.847
Q7.15 PROJECTS TOO SMALL AND DISPERSED	28	1	4	2.14	.850
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	27	1	4	2.07	.732
Q7.21 LONGER PROCESSES FOR PERMITTING	26	1	3	1.99	.750
Q7.38 SPILL AND POLLUTION PREVENTION	27	1	4	1.91	.919
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	28	1	3	1.89	.786
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	24	1	3	1.72	.744
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	24	1	3	1.62	.696

*Table 8.33 Descriptive Statistics for Barriers: Roads*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	21	2	4	3.42	.603
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	19	2	4	3.29	.756
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	21	2	4	3.15	.700
Q7.03 MAINTENANCE AND DURABILITY	21	2	4	3.12	.735
Q7.04 PROJECT COST	22	2	4	3.11	.723
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	23	1	4	3.05	.955
Q7.01 SOIL SUITABILITY FOR INFILTRATION	24	1	4	2.94	.910
Q7.07 RISK/LIABILITY	18	1	4	2.78	.875

Q7.06 STAFF NEED MORE TRAINING	22	2	4	2.77	.685
Q7.05 INSUFFICIENT MUNICIPAL STAFF	22	1	4	2.73	1.077
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	18	1	4	2.69	1.046
Q7.17 PROPERTY RIGHTS CONCERNS	19	1	4	2.68	.820
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	22	1	4	2.67	.825
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	21	2	4	2.63	.575
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	22	1	4	2.60	.846
Q7.22 LACK OF PUBLIC DEMAND	19	1	4	2.58	.838
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	16	1	4	2.56	.727
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	22	1	4	2.55	.963
Q7.36 LACK OF AVAILABLE SPACE	24	1	4	2.52	.875
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	22	1	4	2.48	.790
Q7.24 PUBLIC RESISTANCE	20	1	4	2.45	.887
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	22	1	4	2.41	.908
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	18	1	4	2.40	1.118
Q7.34 MANAGEMENT VISION AND PRIORITIES	22	1	4	2.32	.716
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	21	1	4	2.29	.901
Q7.39 INSUFFICIENT MANDATE FOR LID	22	1	4	2.26	.938
Q7.19 INSUFFICIENT IMPACT FEES	16	1	4	2.25	.977
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	21	1	3	2.24	.625
Q7.10 AESTHETICS	22	1	4	2.23	1.020
Q7.29 INTERVENTION BY ELECTED OFFICIALS	18	1	4	2.22	.878
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	10	1	3	2.10	.738
Q7.21 LONGER PROCESSES FOR PERMITTING	20	1	4	2.08	.973
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	19	1	4	1.96	.821
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	17	1	3	1.94	.748
Q7.15 PROJECTS TOO SMALL AND DISPERSED	19	1	3	1.92	.780
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	19	1	3	1.84	.602
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	16	1	3	1.72	.670
Q7.38 SPILL AND POLLUTION PREVENTION	21	1	4	1.69	.760
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	21	1	4	1.64	.897

*Table 8.34 Descriptive Statistics for Barriers: Natural Resources*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	26	2	4	3.40	.600
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	29	1	4	3.34	.814
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	25	2	4	3.33	.659

Q7.01 SOIL SUITABILITY FOR INFILTRATION	31	1	4	3.18	.916
Q7.04 PROJECT COST	28	1	4	3.14	.789
Q7.03 MAINTENANCE AND DURABILITY	27	2	4	3.13	.670
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	24	1	4	3.12	.937
Q7.05 INSUFFICIENT MUNICIPAL STAFF	29	1	4	3.03	1.017
Q7.17 PROPERTY RIGHTS CONCERNS	26	1	4	2.96	.999
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	25	1	4	2.93	.899
Q7.06 STAFF NEED MORE TRAINING	31	1	4	2.90	.870
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	28	1	4	2.89	.916
Q7.07 RISK/LIABILITY	23	1	4	2.87	.813
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	25	1	4	2.86	.904
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	29	1	4	2.81	1.001
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	21	1	4	2.79	.774
Q7.22 LACK OF PUBLIC DEMAND	23	2	4	2.74	.689
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	27	1	4	2.71	1.066
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	25	1	4	2.70	.887
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	26	1	4	2.70	.831
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	29	1	4	2.69	.930
Q7.19 INSUFFICIENT IMPACT FEES	21	1	4	2.68	.878
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	28	1	4	2.68	1.156
Q7.39 INSUFFICIENT MANDATE FOR LID	25	1	4	2.63	.999
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	20	1	4	2.60	.883
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	27	1	4	2.59	.888
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	26	1	4	2.58	1.102
Q7.24 PUBLIC RESISTANCE	25	1	4	2.48	.823
Q7.29 INTERVENTION BY ELECTED OFFICIALS	25	1	4	2.40	.957
Q7.36 LACK OF AVAILABLE SPACE	29	1	4	2.40	1.010
Q7.34 MANAGEMENT VISION AND PRIORITIES	29	1	4	2.38	.903
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	27	1	4	2.35	.935
Q7.15 PROJECTS TOO SMALL AND DISPERSED	26	1	4	2.26	.924
Q7.10 AESTHETICS	29	1	4	2.24	.830
Q7.21 LONGER PROCESSES FOR PERMITTING	28	1	4	2.20	1.036
Q7.38 SPILL AND POLLUTION PREVENTION	28	1	4	2.15	.956
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	25	1	4	2.12	.961
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	27	1	4	2.04	.854
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	23	1	3	1.84	.818

*Table 8.35 Descriptive Statistics for Barriers: Municipal Manager/Executive*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	20	2	4	3.34	.596
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	16	2	4	3.21	.688
Q7.01 SOIL SUITABILITY FOR INFILTRATION	18	1	4	3.12	.873
Q7.04 PROJECT COST	17	2	4	3.12	.667
Q7.05 INSUFFICIENT MUNICIPAL STAFF	19	1	4	3.09	.880
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	17	1	4	3.07	.867
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	17	2	4	3.01	.761
Q7.03 MAINTENANCE AND DURABILITY	15	2	4	2.95	.662
Q7.17 PROPERTY RIGHTS CONCERNS	16	1	4	2.89	.868
Q7.22 LACK OF PUBLIC DEMAND	17	2	4	2.89	.769
Q7.24 PUBLIC RESISTANCE	14	2	4	2.72	.724
Q7.06 STAFF NEED MORE TRAINING	16	2	4	2.66	.700
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	15	2	4	2.63	.715
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	15	2	4	2.63	.855
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	18	1	4	2.57	.772
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	18	1	4	2.56	.981
Q7.07 RISK/LIABILITY	13	2	4	2.54	.772
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	20	1	4	2.54	.929
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	16	2	4	2.51	.624
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	14	1	4	2.50	.762
Q7.36 LACK OF AVAILABLE SPACE	18	1	4	2.49	.764
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	18	1	4	2.49	.905
Q7.19 INSUFFICIENT IMPACT FEES	15	1	4	2.40	1.032
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	14	1	4	2.30	.956
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	18	1	4	2.30	1.016
Q7.29 INTERVENTION BY ELECTED OFFICIALS	15	1	4	2.25	1.040
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	11	1	4	2.20	.843
Q7.34 MANAGEMENT VISION AND PRIORITIES	20	1	4	2.16	.875
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	17	1	4	2.14	1.074
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	13	1	4	2.14	.901
Q7.21 LONGER PROCESSES FOR PERMITTING	16	1	4	2.08	.895
Q7.10 AESTHETICS	18	1	4	2.05	.803
Q7.39 INSUFFICIENT MANDATE FOR LID	18	1	4	2.04	.804
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	15	1	4	2.02	.893
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	15	1	4	1.98	.849



Q7.15 PROJECTS TOO SMALL AND DISPERSED	14	1	3	1.96	.788
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	18	1	4	1.90	.967
Q7.38 SPILL AND POLLUTION PREVENTION	13	1	3	1.80	.510
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	15	1	3	1.64	.597

*Table 8.36 Descriptive Statistics for Barriers: Elected Officials*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.04 PROJECT COST	11	3	4	3.51	.566
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	10	2	4	3.37	.724
Q7.05 INSUFFICIENT MUNICIPAL STAFF	12	2	4	3.33	.778
Q7.03 MAINTENANCE AND DURABILITY	10	2	4	3.28	.691
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	12	2	4	3.16	.721
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	12	1	4	3.12	.858
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	12	1	4	3.12	.963
Q7.17 PROPERTY RIGHTS CONCERNS	10	2	4	3.10	.738
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	10	2	4	2.98	.846
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	12	2	4	2.94	.879
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	11	2	4	2.93	.807
Q7.22 LACK OF PUBLIC DEMAND	11	2	4	2.91	.539
Q7.06 STAFF NEED MORE TRAINING	11	2	4	2.91	.831
Q7.07 RISK/LIABILITY	9	2	4	2.89	.778
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	9	1	4	2.89	1.054
Q7.24 PUBLIC RESISTANCE	9	2	4	2.89	.782
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	11	1	4	2.82	.982
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	10	1	4	2.81	1.022
Q7.29 INTERVENTION BY ELECTED OFFICIALS	8	1	4	2.75	1.035
Q7.01 SOIL SUITABILITY FOR INFILTRATION	11	1	4	2.70	1.100
Q7.36 LACK OF AVAILABLE SPACE	12	2	4	2.69	.762
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	11	2	4	2.65	.802
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	11	1	4	2.64	1.025
Q7.39 INSUFFICIENT MANDATE FOR LID	11	2	4	2.63	.815
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	8	1	4	2.63	.916
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	5	1	3	2.60	.894
Q7.34 MANAGEMENT VISION AND PRIORITIES	12	1	4	2.58	.793
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	10	1	4	2.58	1.280
Q7.10 AESTHETICS	11	1	4	2.55	.934
Q7.15 PROJECTS TOO SMALL AND DISPERSED	9	1	4	2.54	1.142

Q7.19 INSUFFICIENT IMPACT FEES	8	1	4	2.46	1.097
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	11	1	4	2.45	.934
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	11	1	3	2.27	.647
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	10	1	4	2.25	1.185
Q7.38 SPILL AND POLLUTION PREVENTION	9	1	4	2.02	.956
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	9	1	3	2.00	.707
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	10	1	2	1.78	.416
Q7.21 LONGER PROCESSES FOR PERMITTING	9	1	3	1.75	.662
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	9	1	3	1.69	.687

*Table 8.37 Descriptive Statistics for Barriers: Other*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q7.17 PROPERTY RIGHTS CONCERNS	8	3	4	3.88	.354
Q7.05 INSUFFICIENT MUNICIPAL STAFF	7	2	4	3.57	.787
Q7.33 LACK OF PUBLIC UNDERSTANDING OF SHORELINE PROCESSES	6	3	4	3.50	.548
Q7.26 CONFLICTING PRIORITIES ACROSS MUNICIPAL DIVISIONS	10	3	4	3.50	.527
Q7.22 LACK OF PUBLIC DEMAND	6	3	4	3.50	.548
Q7.30 DIFFICULT FOR PUBLIC AGENCIES TO ENSURE PROPER MAINTENANCE IS OCCURRING ON PRIVATE PROPERTY	9	2	4	3.44	.726
Q7.25 UNCERTAINTIES IN PERFORMANCE AND COST	9	2	4	3.44	.726
Q7.18 DEVELOPERS NOT HELD ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	7	2	4	3.43	.787
Q7.13 RESTRICTIONS ON SPENDING PUBLIC MONEY ON PRIVATE PROPERTY	7	3	4	3.43	.535
Q7.24 PUBLIC RESISTANCE	5	3	4	3.40	.548
Q7.11 INSUFFICIENT ENFORCEMENT OF EXISTING CODES AND REGULATIONS	5	3	4	3.40	.548
Q7.32 LEGACY INFRASTRUCTURE DOESN'T COMPLY W/ PRESENT STANDARDS	8	2	4	3.38	.916
Q7.37 UNCLEAR DEFINITIONS OF LID & 'WHERE FEASIBLE'	9	2	4	3.33	.866
Q7.03 MAINTENANCE AND DURABILITY	10	2	4	3.30	.675
Q7.28 FRAGMENTED JURISDICTIONS AND RESPONSIBILITIES	8	2	4	3.25	.886
Q7.07 RISK/LIABILITY	8	2	4	3.13	.835
Q7.01 SOIL SUITABILITY FOR INFILTRATION	9	2	4	3.11	.928
Q7.39 INSUFFICIENT MANDATE FOR LID	7	1	4	3.00	1.000
Q7.31 NATURAL RESOURCES DEFINED BY COMMERCIAL NOT ECOLOGICAL VALUE	6	2	4	3.00	.632
Q7.19 INSUFFICIENT IMPACT FEES	6	2	4	3.00	.632
Q7.06 STAFF NEED MORE TRAINING	9	2	4	3.00	.866
Q7.34 MANAGEMENT VISION AND PRIORITIES	8	2	4	2.88	.641
Q7.27 MUNICIPAL STAFF RESISTANT TO CHANGE	8	1	4	2.88	1.126
Q7.15 PROJECTS TOO SMALL AND DISPERSED	8	2	4	2.88	.641
Q7.12 CONFLICTING MANDATES, CODES, AND REGULATIONS	8	2	4	2.88	.991

Q7.04 PROJECT COST	8	2	4	2.88	.641
Q7.20 INITIAL COSTS ARE SHORT-TERM, ECONOMIC BENEFITS ARE LONG-TERM	8	2	4	2.88	.641
Q7.36 LACK OF AVAILABLE SPACE	6	1	4	2.83	.983
Q7.35 UNEQUAL ABILITY OF SOME SOCIAL GROUPS TO ACCESS INCENTIVES	6	1	4	2.83	1.169
Q7.08 NEED MORE OR IMPROVED GUIDANCE ( MANUALS/DESIGN STANDARDS)	10	2	4	2.80	.789
Q7.23 COORDINATION WITH OTHER JURISDICTIONS	7	1	4	2.71	1.113
Q7.02 AVAILABILITY OF CONTRACTORS WITH APPROPRIATE SKILLS	6	1	4	2.67	1.211
Q7.21 LONGER PROCESSES FOR PERMITTING	6	2	4	2.50	.837
Q7.29 INTERVENTION BY ELECTED OFFICIALS	5	2	4	2.40	.894
Q7.38 SPILL AND POLLUTION PREVENTION	9	1	4	2.33	1.118
Q7.10 AESTHETICS	7	1	3	2.14	.690
Q7.14 NEW DEVELOPMENT IS MOVING TO NEIGHBORING JURISDICTIONS WHERE LID IS NOT REQUIRED	8	1	3	2.13	.835
Q7.16 ACCESS FOR FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC.	7	1	3	1.97	.584
Q7.09 GUIDANCE AVAILABLE IS NOT RELEVANT TO THIS MUNICIPALITY	8	1	2	1.63	.518

## Appendix L

### Descriptive Statistics for Internal Solutions

#### Research Question 7: What internal changes might remove those barriers?

#### Q9. Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction.

*Table 9.1 Descriptive Statistics for Internal Solutions: Total*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	137	1	4	3.42	.715
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	137	1	4	3.32	.923
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	135	1	4	3.30	.775
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	145	1	4	3.17	.877
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	140	1	4	3.12	.869
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	141	1	4	3.04	.909
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	137	1	4	3.03	.866
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	141	1	4	3.02	.815
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	133	1	4	2.97	.921
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	112	1	4	2.93	1.011
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	114	1	4	2.92	.894
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	137	1	4	2.91	1.035
Q9.21 DEMONSTRATION PROJECTS	142	1	4	2.89	.831
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	123	1	4	2.88	.972
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	123	1	4	2.81	1.011
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	122	1	4	2.79	.973
Q9.10 EXPEDITED PERMITS AS INCENTIVE	133	1	4	2.71	1.063
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	133	1	4	2.66	.992
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	114	1	4	2.48	1.075
Q9.07 INCREASING IMPACT FEES	120	1	4	2.48	1.045
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	122	1	4	2.05	1.082

#### Q1. Municipality Characteristics: Which of the following best describes the municipality where you work?

- 1 - City
- 2 - County

**Q9. Rate the relative value of the following potential internal changes that might help remove barriers to green infrastructure projects in your jurisdiction.**

- 1 – Not a solution
- 2 – Somewhat helpful
- 3 – Generally helpful
- 4 – Very helpful

*Table 9.2 Descriptive Statistics for Internal Solutions: City*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	94	2	4	3.45	.697
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	94	1	4	3.30	.937
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	89	1	4	3.29	.801
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	98	1	4	3.21	.876
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	95	1	4	3.07	.841
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	93	1	4	3.05	.937
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	95	1	4	2.99	.951
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	96	1	4	2.98	.846
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	95	1	4	2.95	.915
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	85	1	4	2.93	.961
Q9.21 DEMONSTRATION PROJECTS	95	1	4	2.92	.846
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	77	1	4	2.87	1.018
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	82	1	4	2.87	1.028
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	92	1	4	2.86	1.023
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	78	1	4	2.82	.908
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	82	1	4	2.77	.947
Q9.10 EXPEDITED PERMITS AS INCENTIVE	90	1	4	2.60	1.047
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	90	1	4	2.54	.950
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	79	1	4	2.46	1.095
Q9.07 INCREASING IMPACT FEES	83	1	4	2.37	1.090
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	82	1	4	1.99	1.083

*Table 9.3 Descriptive Statistics for Internal Solutions: County*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	38	1	4	3.37	.913
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	38	1	4	3.34	.781

Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	41	2	4	3.32	.722
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	42	2	4	3.29	.673
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	41	1	4	3.22	.822
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	31	1	4	3.19	.792
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	40	1	4	3.10	.778
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	31	1	4	3.10	.944
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	42	1	4	3.10	.821
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	40	1	4	3.00	1.109
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	38	1	4	2.97	1.052
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	33	1	4	2.97	.984
Q9.10 EXPEDITED PERMITS AS INCENTIVE	38	1	4	2.95	1.064
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	37	1	4	2.92	.924
Q9.21 DEMONSTRATION PROJECTS	42	1	4	2.88	.772
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	36	1	4	2.75	.996
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	33	1	4	2.73	1.008
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	35	1	4	2.71	1.045
Q9.07 INCREASING IMPACT FEES	32	1	4	2.66	.937
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	30	1	4	2.53	1.042
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	35	1	4	2.20	1.079

*Table 9.4 Descriptive Statistics for Internal Solutions: City and County*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	132	1	4	3.42	.721
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	132	1	4	3.32	.927
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	130	1	4	3.30	.774
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	140	1	4	3.18	.859
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	135	1	4	3.13	.868
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	136	1	4	3.06	.917
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	132	1	4	3.03	.864
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	136	1	4	3.01	.825
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	128	1	4	2.95	.929
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	108	1	4	2.94	.998
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	109	1	4	2.93	.889
Q9.21 DEMONSTRATION PROJECTS	137	1	4	2.91	.821
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	132	1	4	2.90	1.047
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	118	1	4	2.87	.974

Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	118	1	4	2.83	1.015
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	117	1	4	2.75	.973
Q9.10 EXPEDITED PERMITS AS INCENTIVE	128	1	4	2.70	1.060
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	128	1	4	2.67	.997
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	109	1	4	2.48	1.077
Q9.07 INCREASING IMPACT FEES	115	1	4	2.45	1.053
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	117	1	4	2.05	1.082

*Table 9.5 Descriptive Statistics for Internal Solutions: Urban*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	72	2	4	3.46	.711
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	68	1	4	3.37	.913
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	65	1	4	3.23	.844
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	72	1	4	3.22	.892
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	68	1	4	3.12	.890
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	69	1	4	3.07	.896
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	69	1	4	3.06	.906
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	70	1	4	3.01	.925
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	72	1	4	3.01	.796
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	56	1	4	3.00	.953
Q9.21 DEMONSTRATION PROJECTS	70	1	4	2.97	.851
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	65	1	4	2.97	.951
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	59	1	4	2.88	1.001
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	69	1	4	2.87	1.028
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	61	1	4	2.87	1.087
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	58	1	4	2.86	.907
Q9.10 EXPEDITED PERMITS AS INCENTIVE	67	1	4	2.64	1.138
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	59	1	4	2.61	1.099
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	66	1	4	2.55	.948
Q9.07 INCREASING IMPACT FEES	60	1	4	2.38	1.059
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	59	1	4	1.97	1.066

*Table 9.6 Descriptive Statistics for Internal Solutions: Rural*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	12	3	4	3.67	.492

Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	13	2	4	3.38	.870
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	14	1	4	3.21	.975
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	12	2	4	3.17	.718
Q9.07 INCREASING IMPACT FEES	11	1	4	3.09	1.136
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	11	1	4	3.09	1.136
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	13	2	4	3.08	.954
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	14	1	4	3.07	.997
Q9.21 DEMONSTRATION PROJECTS	13	1	4	3.00	.913
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	14	2	4	3.00	.784
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	13	1	4	3.00	.913
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	10	1	4	3.00	1.247
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	13	1	4	3.00	.913
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	14	2	4	2.93	.829
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	12	2	4	2.92	.793
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	12	1	4	2.83	1.030
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	12	1	4	2.83	.937
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	13	2	4	2.77	.927
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	13	1	4	2.69	.855
Q9.10 EXPEDITED PERMITS AS INCENTIVE	14	1	4	2.43	1.158
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	13	1	4	2.31	1.182

*Table 9.7 Descriptive Statistics for Internal Solutions: Urban and Rural*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	58	2	4	3.41	.702
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	53	1	4	3.32	.754
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	55	1	4	3.29	.936
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	60	1	4	3.15	.860
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	59	1	4	3.07	.848
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	55	1	4	3.04	.860
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	58	1	4	3.02	.908
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	54	1	4	3.00	.847
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	43	1	4	2.98	.886
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	56	1	4	2.95	1.102
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	51	1	4	2.94	.904
Q9.10 EXPEDITED PERMITS AS INCENTIVE	52	1	4	2.88	.922
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	43	1	4	2.88	1.117



Q9.21 DEMONSTRATION PROJECTS	59	1	4	2.78	.789
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	50	1	4	2.74	.944
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	54	1	4	2.70	1.039
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	47	1	4	2.70	.954
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	50	1	4	2.70	.974
Q9.07 INCREASING IMPACT FEES	49	1	4	2.45	.980
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	45	1	4	2.20	.944
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	50	1	4	2.08	1.085

*Table 9.8 Descriptive Statistics for Internal Solutions: Very Large*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	50	1	4	3.46	.734
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	48	1	4	3.46	.824
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	51	1	4	3.33	.739
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	52	2	4	3.29	.667
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	52	1	4	3.19	.793
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	53	1	4	3.19	.810
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	45	1	4	3.16	.952
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	44	1	4	3.14	.905
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	52	1	4	3.08	.763
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	52	1	4	3.08	1.045
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	40	1	4	3.08	.829
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	47	1	4	3.06	.870
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	45	1	4	2.93	1.031
Q9.10 EXPEDITED PERMITS AS INCENTIVE	48	1	4	2.90	1.016
Q9.21 DEMONSTRATION PROJECTS	53	1	4	2.89	.776
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	43	1	4	2.88	.956
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	47	1	4	2.85	1.000
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	48	1	4	2.73	1.005
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	40	1	4	2.53	1.012
Q9.07 INCREASING IMPACT FEES	44	1	4	2.48	1.000
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	44	1	4	2.20	1.091

*Table 9.9 Descriptive Statistics for Internal Solutions: Large*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	42	2	4	3.50	.707

Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	42	1	4	3.50	.773
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	39	2	4	3.31	.800
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	43	1	4	3.28	.934
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	43	1	4	3.21	.861
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	41	2	4	3.17	.834
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	43	2	4	3.16	.785
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	42	2	4	3.10	.821
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	42	1	4	3.07	.921
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	37	2	4	3.05	.780
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	40	1	4	3.05	1.011
Q9.21 DEMONSTRATION PROJECTS	42	2	4	3.02	.780
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	37	1	4	3.00	1.000
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	42	1	4	3.00	.883
Q9.10 EXPEDITED PERMITS AS INCENTIVE	41	1	4	2.98	1.012
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	29	1	4	2.93	.961
Q9.07 INCREASING IMPACT FEES	32	1	4	2.78	.832
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	39	1	4	2.74	.938
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	35	1	4	2.74	.950
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	33	1	4	2.61	1.029
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	36	1	4	2.25	1.079

*Table 9.10 Descriptive Statistics for Internal Solutions: Mid-Sized*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	36	2	4	3.44	.735
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	35	2	4	3.31	.718
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	35	1	4	3.14	1.061
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	37	1	4	3.08	.862
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	37	1	4	3.05	.970
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	35	1	4	2.89	.993
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	36	1	4	2.86	1.099
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	36	1	4	2.86	.899
Q9.21 DEMONSTRATION PROJECTS	37	1	4	2.78	.976
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	32	1	4	2.78	.906
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	31	1	4	2.74	1.154
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	32	1	4	2.69	.965
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	35	1	4	2.69	1.157

Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	35	1	4	2.66	.938
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	29	1	4	2.66	.974
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	31	1	4	2.58	1.089
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	36	1	4	2.47	1.082
Q9.07 INCREASING IMPACT FEES	32	1	4	2.28	1.198
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	31	1	4	2.26	1.210
Q9.10 EXPEDITED PERMITS AS INCENTIVE	34	1	4	2.21	1.095
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	32	1	4	1.72	1.054

*Table 9.11 Descriptive Statistics for Internal Solutions: Small*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	10	2	4	3.30	.675
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	12	2	4	3.08	.669
Q9.21 DEMONSTRATION PROJECTS	10	2	4	2.80	.789
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	8	2	4	2.75	.886
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	11	2	4	2.73	.905
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	10	1	4	2.70	1.160
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	10	2	4	2.70	.823
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	10	2	4	2.70	.823
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	12	1	4	2.67	1.073
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	8	2	4	2.63	.744
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	10	1	4	2.60	1.075
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	9	2	4	2.56	.726
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	11	2	3	2.55	.522
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	8	1	4	2.50	1.069
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	8	1	4	2.50	1.195
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	12	1	4	2.50	.798
Q9.10 EXPEDITED PERMITS AS INCENTIVE	10	1	4	2.50	.850
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	10	1	4	2.30	.949
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	8	1	3	2.25	.886
Q9.07 INCREASING IMPACT FEES	12	1	4	2.17	1.193
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	10	1	4	1.70	.949

*Table 9.12 Descriptive Statistics for Internal Solutions: Phase I NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	37	1	4	3.32	.784

Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	41	1	4	3.32	.756
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	37	1	4	3.30	.909
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	40	2	4	3.28	.716
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	41	2	4	3.27	.807
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	40	2	4	3.23	.698
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	37	1	4	3.22	.976
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	41	1	4	3.20	.782
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	41	1	4	3.17	.972
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	37	1	4	3.11	.875
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	33	1	4	3.06	.966
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	36	1	4	2.97	.941
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	29	1	4	2.97	.823
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	38	1	4	2.95	.899
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	37	1	4	2.95	.970
Q9.21 DEMONSTRATION PROJECTS	40	1	4	2.93	.797
Q9.10 EXPEDITED PERMITS AS INCENTIVE	39	1	4	2.79	1.080
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	34	1	4	2.74	.963
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	30	1	4	2.70	1.022
Q9.07 INCREASING IMPACT FEES	34	1	4	2.47	1.107
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	34	1	4	2.15	1.077

*Table 9.13 Descriptive Statistics for Internal Solutions: Phase II NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	75	1	4	3.49	.812
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	76	2	4	3.43	.718
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	72	2	4	3.42	.707
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	78	1	4	3.26	.932
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	76	1	4	3.04	.901
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	75	1	4	3.01	.862
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	70	1	4	3.00	.993
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	76	1	4	3.00	.952
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	78	1	4	2.97	.852
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	59	1	4	2.95	1.041
Q9.21 DEMONSTRATION PROJECTS	77	1	4	2.95	.841
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	72	1	4	2.93	.861
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	67	1	4	2.90	.907

Q9.10 EXPEDITED PERMITS AS INCENTIVE	72	1	4	2.78	1.078
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	64	1	4	2.77	.955
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	68	1	4	2.76	1.053
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	76	1	4	2.74	1.050
Q9.07 INCREASING IMPACT FEES	62	1	4	2.50	.971
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	73	1	4	2.48	.988
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	64	1	4	2.39	1.093
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	66	1	4	2.03	1.081

*Table 9.14 Descriptive Statistics for Internal Solutions: Not a NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	13	3	4	3.54	.519
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	13	2	4	3.46	.776
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	11	2	4	3.00	.775
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	14	1	4	3.00	.961
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	12	2	4	2.92	.900
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	11	1	4	2.91	1.044
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	14	2	4	2.86	.770
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	13	1	4	2.85	1.144
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	10	1	4	2.80	1.033
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	14	1	4	2.79	.802
Q9.21 DEMONSTRATION PROJECTS	13	1	4	2.77	.927
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	14	1	4	2.71	.825
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	10	1	4	2.60	1.174
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	14	1	4	2.50	.941
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	13	2	4	2.46	.660
Q9.07 INCREASING IMPACT FEES	13	1	4	2.46	1.050
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	11	1	4	2.36	1.120
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	12	1	4	2.33	.778
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	11	1	4	2.27	.786
Q9.10 EXPEDITED PERMITS AS INCENTIVE	14	1	3	2.00	.784
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	13	1	4	1.85	1.144

*Table 9.15 Descriptive Statistics for Internal Solutions: Region: Northwest*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	92	1	4	3.37	.752

Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	90	1	4	3.28	.948
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	92	2	4	3.27	.800
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	95	1	4	3.12	.874
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	97	1	4	3.09	.855
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	94	1	4	3.09	.900
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	92	1	4	3.08	.952
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	95	1	4	3.00	.945
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	95	1	4	2.96	.824
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	79	1	4	2.95	.986
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	90	1	4	2.92	.974
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	75	1	4	2.88	.915
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	82	1	4	2.88	.999
Q9.21 DEMONSTRATION PROJECTS	95	1	4	2.86	.820
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	82	1	4	2.84	1.000
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	83	1	4	2.77	1.016
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	88	1	4	2.69	.951
Q9.10 EXPEDITED PERMITS AS INCENTIVE	93	1	4	2.66	1.048
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	76	1	4	2.58	1.074
Q9.07 INCREASING IMPACT FEES	82	1	4	2.43	1.066
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	84	1	4	2.08	1.078

*Table 9.16 Descriptive Statistics for Internal Solutions: Region: Southwest*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	39	2	4	3.49	.644
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	41	1	4	3.44	.838
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	42	1	4	3.31	.869
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	37	1	4	3.30	.740
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	37	2	4	3.14	.631
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	39	1	4	3.10	.852
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	40	1	4	3.10	.810
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	37	1	4	3.03	.799
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	34	1	4	2.97	.834
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	41	1	4	2.95	.947
Q9.21 DEMONSTRATION PROJECTS	41	1	4	2.93	.848
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	35	1	4	2.89	.932
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	30	1	4	2.87	1.042

Q9.10 EXPEDITED PERMITS AS INCENTIVE	34	1	4	2.76	1.075
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	34	1	4	2.68	.843
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	36	1	4	2.67	1.042
Q9.07 INCREASING IMPACT FEES	33	1	4	2.58	1.062
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	39	1	4	2.56	1.095
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	39	1	4	2.46	1.144
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	34	1	4	2.26	1.082
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	33	1	4	1.88	1.053

*Table 9.17 Descriptive Statistics for Internal Solutions: Both Northwest and Southwest*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	6	3	4	3.83	.408
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	6	3	4	3.83	.408
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	5	3	4	3.80	.447
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	6	3	4	3.50	.548
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	6	1	4	3.50	1.225
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	6	2	4	3.33	.816
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	6	2	4	3.33	1.033
Q9.10 EXPEDITED PERMITS AS INCENTIVE	6	1	4	3.33	1.211
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	6	2	4	3.33	.816
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	5	2	4	3.20	1.095
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	6	1	4	3.17	1.169
Q9.21 DEMONSTRATION PROJECTS	6	2	4	3.17	.983
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	6	2	4	3.17	.753
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	3	1	4	3.00	1.732
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	6	2	4	3.00	.894
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	6	1	4	2.83	.983
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	5	2	4	2.80	1.095
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	5	2	4	2.80	.837
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	5	1	4	2.60	1.342
Q9.07 INCREASING IMPACT FEES	5	2	3	2.60	.548
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	4	1	3	2.50	1.000

*Table 9.18 Descriptive Statistics for Internal Solutions: Executive Staff*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	22	2	4	3.45	.671

Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	21	2	4	3.38	.740
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	23	2	4	3.35	.647
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	21	2	4	3.24	.768
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	19	2	4	3.16	.834
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	19	2	4	3.16	.898
Q9.21 DEMONSTRATION PROJECTS	21	1	4	3.05	.973
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	22	2	4	3.05	.722
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	22	2	4	2.95	.785
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	20	1	4	2.85	.988
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	22	1	4	2.82	.795
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	19	1	4	2.79	.976
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	19	1	4	2.79	.713
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	23	1	4	2.70	1.020
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	20	1	4	2.65	.813
Q9.10 EXPEDITED PERMITS AS INCENTIVE	22	1	4	2.64	1.002
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	19	1	4	2.63	.955
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	21	1	4	2.62	1.117
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	21	1	4	2.62	.921
Q9.07 INCREASING IMPACT FEES	22	1	4	2.36	.953
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	21	1	4	1.76	.889

*Table 9.19 Descriptive Statistics for Internal Solutions: Mid-Management*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	35	2	4	3.51	.612
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	38	2	4	3.39	.718
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	37	1	4	3.35	.889
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	38	1	4	3.26	.860
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	37	1	4	3.05	.880
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	39	1	4	3.05	.944
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	34	1	4	3.03	.904
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	35	1	4	2.91	.919
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	30	1	4	2.87	.776
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	36	1	4	2.86	.899
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	38	1	4	2.84	.886
Q9.21 DEMONSTRATION PROJECTS	38	1	4	2.79	.777
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	33	1	4	2.79	1.053



Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	35	1	4	2.77	.973
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	38	1	4	2.76	1.101
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	35	1	4	2.71	1.045
Q9.10 EXPEDITED PERMITS AS INCENTIVE	36	1	4	2.58	1.025
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	38	1	4	2.55	1.005
Q9.07 INCREASING IMPACT FEES	34	1	4	2.53	1.080
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	31	1	4	2.29	1.006
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	33	1	4	1.91	1.042

*Table 9.20 Descriptive Statistics for Internal Solutions: Line Staff*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	64	1	4	3.36	.764
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	67	2	4	3.30	.817
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	64	1	4	3.27	.996
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	65	1	4	3.26	.834
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	69	1	4	3.16	.816
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	69	1	4	3.09	.903
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	65	1	4	3.08	.941
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	67	2	4	3.07	.765
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	51	1	4	3.02	.948
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	62	1	4	3.02	1.000
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	66	1	4	3.00	.911
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	55	1	4	2.87	.982
Q9.21 DEMONSTRATION PROJECTS	69	1	4	2.87	.784
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	48	1	4	2.85	1.010
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	53	1	4	2.77	.993
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	55	1	4	2.76	.999
Q9.10 EXPEDITED PERMITS AS INCENTIVE	63	1	4	2.75	1.092
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	60	1	4	2.68	1.000
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	50	1	4	2.52	1.092
Q9.07 INCREASING IMPACT FEES	49	1	4	2.49	1.023
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	55	1	4	2.16	1.118

**Q12. Which of the following best describes the municipal division(s) where you work? Check all that apply.**

*Table 9.21 Descriptive Statistics for Internal Solutions: Planning*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	41	2	4	3.39	.703
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	37	2	4	3.22	.854
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	39	1	4	3.21	1.005
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	40	1	4	3.10	.928
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	41	1	4	3.10	.917
Q9.21 DEMONSTRATION PROJECTS	40	2	4	3.05	.714
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	34	1	4	3.00	.816
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	40	1	4	3.00	.784
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	35	1	4	3.00	1.000
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	41	1	4	2.95	.865
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	35	1	4	2.94	.873
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	30	1	4	2.93	.944
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	41	1	4	2.90	.831
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	37	1	4	2.84	.898
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	38	1	4	2.82	.865
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	38	1	4	2.71	1.063
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	33	1	4	2.61	1.029
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	40	1	4	2.58	.958
Q9.10 EXPEDITED PERMITS AS INCENTIVE	41	1	4	2.41	1.095
Q9.07 INCREASING IMPACT FEES	35	1	4	2.17	.923
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	35	1	4	1.66	.765

*Table 9.22 Descriptive Statistics for Internal Solutions: Permitting*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	42	2	4	3.36	.727
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	41	1	4	3.24	.916
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	40	2	4	3.23	.832
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	41	1	4	3.17	.892
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	40	1	4	3.13	.822
Q9.21 DEMONSTRATION PROJECTS	42	2	4	3.07	.778
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	42	1	4	3.05	.987
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	41	1	4	2.95	.893
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	40	1	4	2.95	.904

Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	37	1	4	2.95	.880
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	36	1	4	2.94	.826
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	41	1	4	2.92	.849
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	34	1	4	2.89	1.003
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	39	1	4	2.82	.970
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	38	1	4	2.81	1.007
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	33	1	4	2.79	.923
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	41	1	4	2.61	1.070
Q9.07 INCREASING IMPACT FEES	36	1	4	2.47	.910
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	30	1	4	2.43	1.040
Q9.10 EXPEDITED PERMITS AS INCENTIVE	38	1	4	2.37	1.076
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	36	1	4	1.64	.762

*Table 9.23 Descriptive Statistics for Internal Solutions: Engineering*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	59	1	4	3.37	.763
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	59	1	4	3.31	.793
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	56	1	4	3.25	.939
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	60	1	4	3.10	.969
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	60	1	4	3.10	.896
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	60	1	4	3.03	.901
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	58	1	4	2.98	.908
Q9.21 DEMONSTRATION PROJECTS	60	1	4	2.92	.850
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	51	1	4	2.90	.922
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	59	1	4	2.88	1.019
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	59	1	4	2.86	.753
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	57	1	4	2.84	.978
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	54	1	4	2.80	1.016
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	49	1	4	2.76	1.128
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	44	1	4	2.70	.978
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	54	1	4	2.70	1.021
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	56	1	4	2.63	.843
Q9.10 EXPEDITED PERMITS AS INCENTIVE	56	1	4	2.48	1.044
Q9.07 INCREASING IMPACT FEES	52	1	4	2.46	1.038
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	47	1	4	2.28	.971
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	53	1	4	2.08	1.124

*Table 9.24 Descriptive Statistics for Internal Solutions: Public Works*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	76	1	4	3.47	.721
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	75	2	4	3.35	.726
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	78	1	4	3.26	.918
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	79	1	4	3.15	.921
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	81	1	4	3.11	.922
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	78	1	4	3.06	.888
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	77	1	4	3.05	.887
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	81	1	4	3.01	.814
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	77	1	4	2.95	.985
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	60	1	4	2.92	.907
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	75	1	4	2.89	.981
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	66	1	4	2.88	.985
Q9.21 DEMONSTRATION PROJECTS	80	1	4	2.86	.882
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	58	1	4	2.81	1.034
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	72	1	4	2.68	1.005
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	68	1	4	2.68	1.043
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	66	1	4	2.67	.950
Q9.10 EXPEDITED PERMITS AS INCENTIVE	75	1	4	2.59	1.041
Q9.07 INCREASING IMPACT FEES	65	1	4	2.52	1.047
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	61	1	4	2.34	.998
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	66	1	4	2.02	1.074

*Table 9.25 Descriptive Statistics for Internal Solutions: Surface Water Management*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	70	2	4	3.46	.695
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	71	1	4	3.31	.803
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	72	1	4	3.24	.942
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	67	1	4	3.19	.941
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	71	1	4	3.14	.867
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	68	1	4	3.01	.938
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	72	1	4	3.01	.927
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	54	1	4	2.96	.971
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	70	1	4	2.94	.814

Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	63	1	4	2.92	1.067
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	67	1	4	2.90	.940
Q9.21 DEMONSTRATION PROJECTS	72	1	4	2.85	.833
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	71	1	4	2.76	1.088
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	54	1	4	2.76	.989
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	59	1	4	2.68	.973
Q9.10 EXPEDITED PERMITS AS INCENTIVE	67	1	4	2.67	1.064
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	64	1	4	2.64	1.132
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	70	1	4	2.63	1.052
Q9.07 INCREASING IMPACT FEES	57	1	4	2.58	1.017
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	56	1	4	2.34	1.049
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	62	1	4	1.97	1.071

*Table 9.26 Descriptive Statistics for Internal Solutions: Community Development*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	24	2	4	3.38	.711
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	22	2	4	3.23	.813
Q9.21 DEMONSTRATION PROJECTS	24	2	4	3.17	.761
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	24	1	4	3.17	1.007
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	25	1	4	3.16	1.028
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	22	1	4	3.09	.811
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	24	1	4	3.04	1.042
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	24	1	4	3.00	.885
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	21	1	4	2.90	.995
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	25	1	4	2.88	.881
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	26	1	4	2.85	.834
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	22	1	4	2.82	.853
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	19	1	4	2.79	.976
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	17	1	4	2.71	1.047
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	24	1	4	2.63	.924
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	24	1	4	2.58	.830
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	21	1	4	2.52	.981
Q9.10 EXPEDITED PERMITS AS INCENTIVE	24	1	4	2.38	1.135
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	21	1	4	2.29	.956
Q9.07 INCREASING IMPACT FEES	21	1	4	2.14	1.014
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	21	1	3	1.57	.676

*Table 9.27 Descriptive Statistics for Internal Solutions: Parks*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	18	2	4	3.50	.618
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	15	2	4	3.40	.737
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	16	2	4	3.31	.704
Q9.21 DEMONSTRATION PROJECTS	17	2	4	3.24	.831
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	17	1	4	3.24	.970
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	13	2	4	3.23	.832
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	14	1	4	3.21	.975
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	10	2	4	3.20	.632
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	17	1	4	3.12	.928
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	17	1	4	3.12	.857
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	18	2	4	3.06	.639
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	15	2	4	2.93	.704
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	17	2	4	2.88	.697
Q9.10 EXPEDITED PERMITS AS INCENTIVE	18	1	4	2.83	1.150
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	18	1	4	2.83	.857
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	18	1	4	2.78	1.003
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	17	1	4	2.76	.903
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGEMENT	17	1	4	2.71	.920
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	15	1	4	2.67	.976
Q9.07 INCREASING IMPACT FEES	16	1	4	2.56	.892
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	15	1	3	1.87	.743

*Table 9.28 Descriptive Statistics for Internal Solutions: Maintenance*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	28	2	4	3.43	.742
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	26	2	4	3.42	.758
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	25	1	4	3.36	.810
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	26	1	4	3.27	.874
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	24	1	4	3.13	.900
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	26	1	4	3.08	.935
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	24	1	4	2.92	.929
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	21	1	4	2.91	.935
Q9.21 DEMONSTRATION PROJECTS	26	2	4	2.88	.864

Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	27	1	4	2.85	.989
Q9.10 EXPEDITED PERMITS AS INCENTIVE	26	1	4	2.85	1.084
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	26	1	4	2.83	1.152
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	28	1	4	2.82	.772
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	27	1	4	2.81	1.001
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	27	1	4	2.81	1.075
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	26	1	4	2.77	1.107
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	22	1	4	2.68	.839
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	22	1	4	2.61	1.133
Q9.07 INCREASING IMPACT FEES	23	1	4	2.43	.992
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	22	1	4	2.22	1.022
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	23	1	4	2.04	1.107

*Table 9.29 Descriptive Statistics for Internal Solutions: Airport*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	3	4	4	4.00	.000
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	3	4	4	4.00	.000
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	4	3	4	3.75	.500
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	3	3	4	3.67	.577
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	3	3	4	3.33	.577
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	4	2	4	3.25	.957
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	4	3	4	3.25	.500
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	4	3	4	3.25	.500
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	4	3	4	3.25	.500
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	4	1	4	3.00	1.414
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	4	2	4	3.00	.816
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	4	1	4	3.00	1.414
Q9.21 DEMONSTRATION PROJECTS	4	2	4	2.75	.957
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	4	2	3	2.75	.500
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	4	2	4	2.75	.957
Q9.10 EXPEDITED PERMITS AS INCENTIVE	4	1	4	2.75	1.500
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	3	2	3	2.67	.577
Q9.07 INCREASING IMPACT FEES	3	2	3	2.67	.577
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	4	1	4	2.50	1.291
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	4	2	3	2.50	.577
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	3	1	2	1.33	.577

*Table 9.30 Descriptive Statistics for Internal Solutions: Education and Outreach*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	30	1	4	3.50	.861
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	29	2	4	3.45	.686
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	31	2	4	3.29	.693
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	28	2	4	3.25	.752
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	28	1	4	3.25	.844
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	30	2	4	3.17	.747
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	31	1	4	3.13	.806
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	26	1	4	3.12	.952
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	29	1	4	3.10	1.047
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	24	1	4	3.08	1.100
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	31	1	4	3.06	.929
Q9.21 DEMONSTRATION PROJECTS	30	2	4	3.03	.809
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	27	1	4	3.00	.920
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	30	1	4	2.97	1.066
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	28	1	4	2.96	.962
Q9.10 EXPEDITED PERMITS AS INCENTIVE	30	1	4	2.87	1.042
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	29	1	4	2.79	.978
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	24	1	4	2.79	.779
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	23	1	4	2.65	.885
Q9.07 INCREASING IMPACT FEES	23	1	4	2.57	.896
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	27	1	4	2.19	1.178

*Table 9.31 Descriptive Statistics for Internal Solutions: Roads*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	21	2	4	3.48	.750
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	23	2	4	3.30	.822
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	24	1	4	3.29	.806
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	23	1	4	3.22	.998
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	23	2	4	3.09	.733
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	22	1	4	3.00	.926
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	18	1	4	3.00	.907
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	14	1	4	2.93	1.141
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	19	1	4	2.89	.809



Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	20	1	4	2.85	.875
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	24	2	4	2.83	.565
Q9.21 DEMONSTRATION PROJECTS	22	2	4	2.82	.853
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	12	1	4	2.75	.965
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	21	1	4	2.71	.845
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	17	1	4	2.71	1.105
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	22	1	4	2.59	1.054
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	22	1	4	2.55	.912
Q9.10 EXPEDITED PERMITS AS INCENTIVE	22	1	4	2.45	1.184
Q9.07 INCREASING IMPACT FEES	20	1	4	2.45	1.146
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	18	1	4	2.33	1.029
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	18	1	4	1.67	.907

*Table 9.32 Descriptive Statistics for Internal Solutions: Natural Resources*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	28	1	4	3.68	.723
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	29	2	4	3.59	.733
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	31	2	4	3.58	.672
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	31	1	4	3.48	.769
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	30	2	4	3.33	.758
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	26	1	4	3.27	.874
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	26	1	4	3.23	1.107
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	26	1	4	3.15	.881
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	26	1	4	3.15	.881
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	30	1	4	3.13	.973
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	30	1	4	3.10	.923
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	27	1	4	3.04	.980
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	30	1	4	3.03	1.033
Q9.10 EXPEDITED PERMITS AS INCENTIVE	30	1	4	3.03	1.033
Q9.21 DEMONSTRATION PROJECTS	31	2	4	3.03	.795
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	29	1	4	3.00	1.000
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	26	1	4	2.88	.909
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	25	1	4	2.84	.943
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	30	1	4	2.60	1.003
Q9.07 INCREASING IMPACT FEES	25	1	4	2.60	.957
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	28	1	4	2.39	1.166

*Table 9.33 Descriptive Statistics for Internal Solutions: Municipal Manager/Executive*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	16	2	4	3.63	.719
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	17	2	4	3.41	.795
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	17	2	4	3.35	.786
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	18	1	4	3.11	.963
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	11	2	4	3.00	.775
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	18	2	4	3.00	.767
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	18	1	4	3.00	.970
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	16	1	4	2.94	.854
Q9.21 DEMONSTRATION PROJECTS	15	2	4	2.93	.884
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	14	1	4	2.93	.997
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	12	1	4	2.92	.996
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	18	2	4	2.89	.758
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	15	1	4	2.87	.834
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	17	1	4	2.82	.883
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	17	1	4	2.76	1.033
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	17	1	4	2.59	.939
Q9.10 EXPEDITED PERMITS AS INCENTIVE	17	1	4	2.53	1.125
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	17	1	4	2.41	1.004
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	15	1	4	2.33	.900
Q9.07 INCREASING IMPACT FEES	15	1	4	2.27	1.163
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	15	1	3	1.47	.640

*Table 9.34 Descriptive Statistics for Internal Solutions: Elected Officials*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q9.03 MAPS SHOWING SOIL SUITABILITY FOR VARIOUS LID TECHNIQUES	10	2	4	3.60	.699
Q9.16 INCENTIVES FOR REMOVAL OF HARD ARMORING ON SHORELINES	7	3	4	3.57	.535
Q9.08 ECONOMIC ANALYSES THAT INCLUDE ECOLOGICAL VALUE OF NATURAL RESOURCES	9	3	4	3.56	.527
Q9.18 CONSIDER STORMWATER DESIGN AT OUTSET OF A PROJECT	11	2	4	3.45	.688
Q9.05 GROUPING SMALL PROJECTS WITHIN NEIGHBORHOOD CLUSTERS	7	3	4	3.43	.535
Q9.02 USING LID DESIGNS THAT DO NOT REQUIRE INFILTRATION ON UNSUITABLE SOILS	10	2	4	3.40	.843
Q9.11 LOCAL EDUCATION AND BEHAVIOR CHANGE EFFORTS	11	3	4	3.27	.467
Q9.13 BRING ENGINEERS, PERMITTING, PLANNING, NATURAL RESOURCE, AND MAINTENANCE STAFF TOGETHER TO ADDRESS COMMUNICATION CHALLENGES	11	2	4	3.18	.751

Q9.07 INCREASING IMPACT FEES	9	2	4	3.11	.782
Q9.15 INCENTIVES FOR RETROFITS OF EXISTING INFRASTRUCTURE	11	1	4	3.09	1.044
Q9.04 MORE FREQUENT INSPECTIONS OF STORMWATER FACILITIES	11	2	4	3.09	.831
Q9.06 ENGAGING STAKEHOLDERS FROM FIRE, SAFETY, DISABILITY, SOLID WASTE, ETC. IN CODE REVISIONS	11	2	4	3.09	.701
Q9.21 DEMONSTRATION PROJECTS	10	2	4	3.00	.943
Q9.14 MAINTENANCE TRAINING FOR PRIVATE PROPERTY HOLDERS	10	1	4	3.00	1.054
Q9.09 MORE STRATEGIC MITIGATION (I.E. BANKING IN LIEU FEES, ETC)	8	2	4	3.00	.535
Q9.01 LOCALIZED MANUALS AND DESIGN STANDARDS	11	2	4	2.91	.701
Q9.19 LIMIT AND/OR REQUIRE MITIGATION FOR IMPERVIOUS SURFACES	11	1	4	2.82	.982
Q9.20 CHARGE STORMWATER FEES BASED UPON AMOUNT OF DISCHARGE	10	1	4	2.70	.949
Q9.10 EXPEDITED PERMITS AS INCENTIVE	10	1	4	2.60	1.075
Q9.17 STRONGER SUPPORT FOR GREEN INFRASTRUCTURE FROM UPPER MANAGMENT	11	1	4	2.27	.905
Q9.12 REORGANIZATION OF STRUCTURAL DIVISIONS AND FUNCTIONS WITHIN YOUR MUNICIPALITY	8	1	3	1.63	.744

## Appendix M

### Descriptive Statistics for External Solutions

#### Research Question 8: What kinds of external support could remove those barriers?

**Q10. Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction.**

*Table 10.1 Descriptive Statistics for External Solutions: Total*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	142	1	4	3.52	.731
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	132	1	4	3.36	.794
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	136	1	4	3.34	.712
Q10.06 GRANTS FOR INCREASING STAFF	137	1	4	3.14	.949
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	131	1	4	3.10	.885
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	137	1	4	3.07	.863
Q10.15 SUPPORT FOR WATERSHED PLANNING	132	1	4	3.06	.923
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	141	1	4	3.06	.868
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	136	1	4	3.04	.877
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	136	1	4	3.04	.988
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	102	1	4	3.03	.873
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	128	1	4	2.99	.968
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	142	1	4	2.99	.875
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	132	1	4	2.96	.952
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	139	1	4	2.94	.907
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	133	1	4	2.86	.919
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	129	1	4	2.73	.998
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	132	1	4	2.73	.958
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	129	1	4	2.69	.917
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	119	1	4	2.69	1.126
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	132	1	4	2.67	1.030
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	109	1	4	2.65	1.109

Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	131	1	4	2.56	1.165
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	135	1	4	2.54	1.077
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	134	1	4	2.51	1.136
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	89	1	4	2.29	1.170

**Q10. Rate the relative value of the following potential forms of external support as they might apply to green infrastructure projects in your jurisdiction.**

- 1 – Not a solution
- 2 – Somewhat helpful
- 3 – Generally helpful
- 4 – Very helpful

*Table 10.2 Descriptive Statistics for External Solutions: City*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	95	1	4	3.57	.709
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	90	1	4	3.26	.855
Q10.06 GRANTS FOR INCREASING STAFF	91	1	4	3.24	.947
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	89	1	4	3.22	.719
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	71	1	4	3.07	.884
Q10.15 SUPPORT FOR WATERSHED PLANNING	88	1	4	3.07	.932
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	93	1	4	3.04	.943
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	94	1	4	3.03	.921
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	95	1	4	3.02	.899
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	96	1	4	2.99	.888
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	91	1	4	2.96	.999
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	85	1	4	2.95	.987
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	91	1	4	2.93	.917
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	86	1	4	2.93	.943
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	92	1	4	2.92	.986
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	91	1	4	2.89	.960
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	88	1	4	2.73	1.014
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	87	1	4	2.72	.898
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	89	1	4	2.67	1.042
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	88	1	4	2.66	.993

Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	88	1	4	2.52	1.164
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	75	1	4	2.49	1.095
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	76	1	4	2.47	1.194
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	91	1	4	2.46	1.158
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	91	1	4	2.45	1.078
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	62	1	4	2.27	1.162

*Table 10.3 Descriptive Statistics for External Solutions: County*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	37	2	4	3.62	.594
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	42	2	4	3.52	.671
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	42	1	4	3.40	.798
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	40	2	4	3.38	.667
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	39	2	4	3.15	.670
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	40	1	4	3.15	.975
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	37	1	4	3.14	.855
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	42	2	4	3.12	.772
Q10.15 SUPPORT FOR WATERSHED PLANNING	39	1	4	3.10	.912
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	39	1	4	3.10	.852
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	39	1	4	3.05	.944
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	35	1	4	3.03	.923
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	43	2	4	3.02	.801
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	41	1	4	2.98	.880
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	30	1	4	2.97	1.129
Q10.06 GRANTS FOR INCREASING STAFF	41	1	4	2.95	.947
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	27	2	4	2.93	.874
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	39	1	4	2.85	.904
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	36	1	4	2.78	.959
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	37	1	4	2.70	.939
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	39	1	4	2.69	1.104
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	38	1	4	2.68	1.068
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	37	1	4	2.65	.949
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	38	1	4	2.58	1.177

Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	38	1	4	2.55	1.108
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	24	1	4	2.33	1.204

*Table 10.4 Descriptive Statistics for External Solutions: Urban*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	68	1	4	3.59	.652
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	65	1	4	3.31	.705
Q10.06 GRANTS FOR INCREASING STAFF	65	1	4	3.25	.952
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	66	1	4	3.21	.886
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	70	1	4	3.17	.851
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	69	1	4	3.14	.944
Q10.15 SUPPORT FOR WATERSHED PLANNING	63	1	4	3.11	.935
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	49	1	4	3.10	.872
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	66	1	4	3.02	.984
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	67	1	4	3.01	.977
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	69	1	4	3.01	.931
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	70	1	4	3.00	.885
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	67	1	4	2.97	.921
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	62	1	4	2.94	.990
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	60	1	4	2.93	.954
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	66	1	4	2.89	.930
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	65	1	4	2.82	.967
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	65	1	4	2.78	1.008
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	67	1	4	2.73	1.095
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	62	1	4	2.73	.872
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	56	1	4	2.64	1.103
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	64	1	4	2.64	1.160
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	66	1	4	2.62	1.134
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	65	1	4	2.54	1.133
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	51	1	4	2.29	1.188
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	44	1	4	2.16	1.200

*Table 10.5 Descriptive Statistics for External Solutions: Rural*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	14	2	4	3.64	.745
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	14	2	4	3.64	.633
Q10.15 SUPPORT FOR WATERSHED PLANNING	13	2	4	3.54	.660
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	13	3	4	3.46	.519
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	14	2	4	3.43	.756
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	14	2	4	3.36	.633
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	14	2	4	3.36	.633
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	13	2	4	3.31	.855
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	10	1	4	3.30	1.059
Q10.06 GRANTS FOR INCREASING STAFF	14	1	4	3.29	1.139
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	14	2	4	3.29	.726
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	12	2	4	3.08	.900
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	13	1	4	3.08	.954
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	14	2	4	3.07	.829
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	14	2	4	3.00	.784
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	14	2	4	3.00	.877
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	9	2	4	2.89	.782
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	14	1	4	2.86	.949
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	14	1	4	2.86	1.167
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	14	1	4	2.86	1.099
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	14	1	4	2.79	1.122
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	14	1	4	2.79	1.051
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	13	1	4	2.69	1.251
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	14	1	4	2.57	1.284
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	13	1	4	2.54	1.330
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	13	1	4	2.46	1.198

*Table 10.6 Descriptive Statistics for External Solutions: Both urban and rural*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	52	2	4	3.48	.641
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	60	1	4	3.42	.829



Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	57	2	4	3.39	.726
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	56	1	4	3.20	.796
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	56	1	4	3.13	.955
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	53	1	4	3.00	.855
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	58	1	4	3.00	.816
Q10.06 GRANTS FOR INCREASING STAFF	58	1	4	2.98	.888
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	55	1	4	2.96	.999
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	54	1	4	2.94	1.017
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	57	1	4	2.93	.904
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	51	1	4	2.92	.935
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	54	1	4	2.91	.784
Q10.15 SUPPORT FOR WATERSHED PLANNING	56	1	4	2.89	.928
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	58	1	4	2.88	.919
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	40	1	4	2.85	.864
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	53	1	4	2.85	.886
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	54	1	4	2.70	.792
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	52	1	4	2.65	.905
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	53	1	4	2.57	.971
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	52	1	4	2.54	1.038
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	43	1	4	2.51	1.099
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	56	1	4	2.48	1.009
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	53	1	4	2.45	1.153
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	55	1	4	2.33	1.106
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	36	1	4	2.31	1.191

*Table 10.7 Descriptive Statistics for External Solutions: Very Large*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	49	1	4	3.47	.793
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	54	1	4	3.46	.745
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	51	2	4	3.37	.692
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	50	1	4	3.26	.828
Q10.15 SUPPORT FOR WATERSHED PLANNING	50	1	4	3.18	.873
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	54	2	4	3.15	.787

Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	50	1	4	3.14	.857
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	51	1	4	3.12	.909
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	35	2	4	3.09	.887
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	45	1	4	3.07	.809
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	47	1	4	3.06	.870
Q10.06 GRANTS FOR INCREASING STAFF	51	1	4	3.02	.969
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	54	2	4	2.98	.812
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	49	1	4	2.98	.968
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	47	1	4	2.96	1.021
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	52	1	4	2.94	.895
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	50	1	4	2.94	.913
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	47	1	4	2.87	.969
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	41	1	4	2.80	1.145
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	46	1	4	2.72	.886
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	49	1	4	2.67	.987
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	50	1	4	2.66	1.171
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	50	1	4	2.58	1.144
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	51	1	4	2.49	1.155
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	47	1	4	2.47	.929
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	32	1	4	2.22	1.157

*Table 10.8 Descriptive Statistics for External Solutions: Large*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	42	2	4	3.60	.587
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	41	1	4	3.44	.709
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	39	2	4	3.36	.707
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	41	1	4	3.34	.794
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	40	1	4	3.25	.840
Q10.06 GRANTS FOR INCREASING STAFF	38	1	4	3.24	.943
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	40	2	4	3.23	.660
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	41	1	4	3.20	.843
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	42	1	4	3.17	.881
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	40	1	4	3.15	.921
Q10.15 SUPPORT FOR WATERSHED PLANNING	38	1	4	3.13	.906
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	35	1	4	3.09	.951

Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	39	1	4	3.08	.870
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	36	1	4	3.06	.893
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	37	2	4	3.05	.743
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	42	2	4	3.05	.731
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	33	1	4	3.03	.883
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	39	2	4	2.97	.778
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	39	1	4	2.95	.972
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	38	1	4	2.74	.891
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	37	1	4	2.73	1.122
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	39	1	4	2.72	1.099
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	35	1	4	2.69	1.078
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	38	1	4	2.68	.842
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	31	1	4	2.65	.950
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	26	1	4	2.27	1.218

*Table 10.9 Descriptive Statistics for External Solutions: Mid-sized*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	33	1	4	3.61	.827
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	32	2	4	3.28	.772
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	32	1	4	3.25	.880
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	35	1	4	3.20	.933
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	24	1	4	3.13	.797
Q10.06 GRANTS FOR INCREASING STAFF	35	1	4	3.11	1.051
Q10.15 SUPPORT FOR WATERSHED PLANNING	33	1	4	2.97	.918
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	32	1	4	2.97	.999
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	33	1	4	2.94	.966
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	35	1	4	2.91	1.067
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	34	1	4	2.91	.900
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	35	1	4	2.86	1.004
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	32	1	4	2.84	1.221
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	34	1	4	2.82	.869

Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	32	1	4	2.78	.941
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	35	1	4	2.74	1.094
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	33	1	4	2.70	1.075
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	31	1	4	2.68	1.194
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	28	1	4	2.54	1.170
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	34	1	4	2.50	1.135
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	31	1	4	2.45	1.179
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	34	1	4	2.41	1.104
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	32	1	4	2.34	1.153
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	22	1	4	2.32	1.249
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	31	1	4	2.29	1.039
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	26	1	4	2.23	1.306

*Table 10.10 Descriptive Statistics for External Solutions: Small*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.06 GRANTS FOR INCREASING STAFF	13	3	4	3.38	.506
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	13	2	4	3.31	.855
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	12	2	4	3.25	.866
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	12	1	4	3.00	.853
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	12	2	4	3.00	.603
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	13	1	4	2.92	.862
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	12	1	4	2.83	1.030
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	13	1	4	2.77	.927
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	11	1	4	2.64	1.027
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	13	1	4	2.62	.961
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	10	1	4	2.60	.966
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	12	1	4	2.58	.793
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	12	1	4	2.58	.996
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	9	1	4	2.56	1.014
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	11	1	4	2.55	.820
Q10.15 SUPPORT FOR WATERSHED PLANNING	11	1	4	2.55	1.128
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	12	1	4	2.50	1.000
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	13	1	4	2.46	1.050

Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	13	1	4	2.38	.870
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	9	1	4	2.33	1.323
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	12	1	4	2.33	1.155
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	13	1	4	2.23	.927
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	10	1	4	2.20	.919
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	12	1	4	2.17	.937
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	13	1	4	2.15	1.214
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	13	1	4	1.92	1.115

*Table 10.11 Descriptive Statistics for External Solutions: Phase I NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	42	1	4	3.45	.803
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	37	2	4	3.43	.689
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	37	1	4	3.43	.899
Q10.15 SUPPORT FOR WATERSHED PLANNING	39	2	4	3.33	.737
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	39	1	4	3.26	.850
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	41	2	4	3.20	.813
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	40	1	4	3.18	.781
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	40	1	4	3.15	.921
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	40	1	4	3.13	.822
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	27	2	4	3.11	.934
Q10.06 GRANTS FOR INCREASING STAFF	38	1	4	3.11	.924
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	38	1	4	3.11	.953
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	41	2	4	3.05	.805
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	38	1	4	3.03	.915
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	34	2	4	3.00	.816
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	37	2	4	3.00	.782
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	36	1	4	2.81	.951
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	38	1	4	2.79	1.094
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	30	1	4	2.77	1.223
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	39	1	4	2.74	.993
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	35	1	4	2.69	.796
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	35	1	4	2.60	1.006

Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	38	1	4	2.58	1.154
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	38	1	4	2.55	1.179
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	38	1	4	2.50	1.225
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	25	1	4	2.20	1.258

*Table 10.12 Descriptive Statistics for External Solutions: Phase II NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	74	1	4	3.59	.681
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	74	1	4	3.34	.727
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	72	1	4	3.32	.747
Q10.06 GRANTS FOR INCREASING STAFF	73	1	4	3.12	.999
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	75	1	4	3.08	.912
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	57	1	4	3.07	.799
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	71	1	4	3.06	.998
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	75	1	4	3.04	.845
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	69	1	4	3.03	.907
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	73	1	4	3.03	.866
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	74	1	4	3.01	1.000
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	76	1	4	2.99	.856
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	72	1	4	2.94	.977
Q10.15 SUPPORT FOR WATERSHED PLANNING	70	1	4	2.94	.961
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	75	1	4	2.91	.947
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	66	1	4	2.89	.979
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	70	1	4	2.80	.861
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	71	1	4	2.65	1.043
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	69	1	4	2.64	1.014
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	71	1	4	2.62	.976
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	73	1	4	2.60	1.010
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	70	1	4	2.60	1.122
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	60	1	4	2.58	1.013
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	61	1	4	2.52	1.149
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	72	1	4	2.50	1.126
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	50	1	4	2.18	1.137

*Table 10.13 Descriptive Statistics for External Solutions: Not a NPDES Stormwater Permittee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	14	2	4	3.50	.650
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	14	2	4	3.43	.756
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	15	2	4	3.40	.632
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	12	2	4	3.17	.577
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	14	2	4	3.14	.770
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	15	1	4	3.13	.834
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	14	2	4	3.07	.730
Q10.06 GRANTS FOR INCREASING STAFF	15	1	4	3.07	1.033
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	15	2	4	3.07	.884
Q10.15 SUPPORT FOR WATERSHED PLANNING	14	1	4	3.00	.961
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	14	1	4	3.00	1.038
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	15	1	4	2.93	.884
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	14	1	4	2.93	1.072
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	13	1	4	2.92	1.115
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	12	2	4	2.92	.669
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	12	1	4	2.92	.996
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	9	1	4	2.89	1.054
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	11	1	4	2.82	.982
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	14	1	4	2.79	.975
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	12	1	4	2.75	1.138
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	12	1	4	2.75	.965
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	14	1	4	2.64	.745
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	14	1	4	2.57	1.284
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	13	1	4	2.54	1.050
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	14	1	4	2.50	1.019
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	13	1	4	2.46	1.050

*Table 10.14 Descriptive Statistics for External Solutions: Region Northwest*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	95	1	4	3.49	.784
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	92	1	4	3.35	.718
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	88	1	4	3.31	.876
Q10.15 SUPPORT FOR WATERSHED PLANNING	90	1	4	3.16	.833
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	96	1	4	3.06	.880
Q10.06 GRANTS FOR INCREASING STAFF	89	1	4	3.06	1.004
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	91	1	4	3.05	.886
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	88	1	4	3.05	.909
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	91	1	4	3.04	.881
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	68	1	4	3.00	.864
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	97	1	4	2.98	.913
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	87	1	4	2.95	.999
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	91	1	4	2.93	1.020
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	85	1	4	2.88	.956
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	94	1	4	2.86	.911
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	87	1	4	2.80	.950
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	83	1	4	2.75	.961
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	88	1	4	2.70	.984
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	90	1	4	2.64	1.020
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	76	1	4	2.62	1.119
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	87	1	4	2.60	1.166
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	74	1	4	2.58	1.182
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	83	1	4	2.55	.887
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	89	1	4	2.51	1.179
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	88	1	4	2.49	1.124
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	60	1	4	2.20	1.190

*Table 10.15 Descriptive Statistics for External Solutions: Region Southwest*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	41	2	4	3.59	.631



Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	38	2	4	3.50	.604
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	38	2	4	3.29	.694
Q10.06 GRANTS FOR INCREASING STAFF	42	1	4	3.29	.835
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	39	1	4	3.18	.914
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	40	1	4	3.13	.822
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	37	1	4	3.11	.843
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	29	1	4	3.10	.900
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	39	1	4	3.10	.882
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	41	1	4	3.10	.970
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	36	1	4	3.06	.893
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	40	1	4	3.03	.891
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	39	1	4	3.00	.858
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	40	1	4	3.00	.847
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	39	1	4	2.95	.793
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	40	1	4	2.88	.939
Q10.15 SUPPORT FOR WATERSHED PLANNING	37	1	4	2.84	1.093
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	32	1	4	2.81	.965
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	37	1	4	2.78	1.134
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	40	1	4	2.75	1.080
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	38	1	4	2.71	.927
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	37	1	4	2.70	1.077
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	41	1	4	2.63	.942
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	39	1	4	2.51	1.023
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	38	1	4	2.50	1.133
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	26	1	4	2.42	1.065

*Table 10.16 Descriptive Statistics for External Solutions: Both Regions*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	6	3	4	3.83	.408
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	6	3	4	3.83	.408
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	6	3	4	3.50	.548
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	6	2	4	3.50	.837
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	6	3	4	3.33	.516

Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	6	2	4	3.33	.816
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	6	2	4	3.33	.816
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	6	2	4	3.33	.816
Q10.06 GRANTS FOR INCREASING STAFF	6	2	4	3.33	.816
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	5	2	4	3.20	1.095
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	5	2	4	3.20	.837
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	6	2	4	3.17	.753
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	6	2	4	3.17	.983
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	6	2	4	3.17	.753
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	6	2	4	3.00	.894
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	6	1	4	3.00	1.265
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	3	1	4	3.00	1.732
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	5	2	4	3.00	1.000
Q10.15 SUPPORT FOR WATERSHED PLANNING	5	2	4	3.00	1.000
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	5	2	4	3.00	1.000
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	6	2	4	2.83	.983
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	3	2	3	2.67	.577
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	6	1	4	2.67	1.366
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	6	1	4	2.50	1.378
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	6	1	4	2.33	1.033
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	6	1	4	2.33	1.506

*Table 10.17 Descriptive Statistics for External Solutions: Executive Staff*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	23	2	4	3.74	.541
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	22	2	4	3.27	.767
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	21	2	4	3.24	.831
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	22	2	4	3.23	.528
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	22	2	4	3.18	.664
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	23	1	4	3.17	.717
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	21	2	4	3.14	.573
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	22	2	4	3.14	.640
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	22	1	4	3.09	.811
Q10.06 GRANTS FOR INCREASING STAFF	23	1	4	3.04	1.022

Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	24	1	4	3.00	.978
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	24	2	4	3.00	.780
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	22	1	4	2.95	.899
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	17	2	4	2.94	.748
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	21	1	4	2.90	.995
Q10.15 SUPPORT FOR WATERSHED PLANNING	23	1	4	2.87	.920
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	22	1	4	2.86	.834
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	19	1	4	2.84	1.119
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	17	1	4	2.65	.996
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	21	1	4	2.57	.870
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	23	1	4	2.57	.788
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	15	1	4	2.40	1.056
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	20	1	4	2.40	.883
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	23	1	4	2.30	1.063
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	23	1	4	2.30	.974
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	22	1	4	2.23	.813

*Table 10.18 Descriptive Statistics for External Solutions: Mid-Management*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	38	2	4	3.53	.647
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	36	2	4	3.33	.632
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	36	1	4	3.22	.898
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	36	1	4	3.08	.906
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	28	2	4	3.07	.766
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	35	1	4	3.06	.968
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	34	1	4	3.00	1.015
Q10.06 GRANTS FOR INCREASING STAFF	37	1	4	2.95	.941
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	36	1	4	2.94	1.040
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	35	1	4	2.91	.951
Q10.15 SUPPORT FOR WATERSHED PLANNING	35	1	4	2.89	.932
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	37	1	4	2.86	.976
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	36	1	4	2.86	.899

Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	37	1	4	2.84	.958
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	32	1	4	2.81	1.091
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	34	1	4	2.79	1.038
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	37	1	4	2.78	.886
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	35	1	4	2.74	.980
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	35	1	4	2.66	.998
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	32	1	4	2.66	1.125
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	33	1	4	2.64	1.141
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	35	1	4	2.63	.973
Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	35	1	4	2.54	.919
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	37	1	4	2.38	.953
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	24	1	4	2.25	1.113
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	37	1	4	2.22	1.109

*Table 10.19 Descriptive Statistics for External Solutions: Line Staff*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q10.13 HOLDING DEVELOPERS ACCOUNTABLE FOR ENVIRONMENTAL DAMAGE	60	1	4	3.52	.725
Q10.05 GRANTS FOR GREEN INFRASTRUCTURE	67	1	4	3.48	.785
Q10.04 LIFETIME MAINTENANCE COST AND PERFORMANCE ANALYSES	65	1	4	3.37	.782
Q10.15 SUPPORT FOR WATERSHED PLANNING	60	1	4	3.22	.885
Q10.06 GRANTS FOR INCREASING STAFF	62	1	4	3.21	.960
Q10.25 REGION-WIDE EDUCATION & BEHAVIOR CHANGE EFFORTS	65	1	4	3.14	.864
Q10.02 MORE GREEN INFRASTRUCTURE TRAINING FOR MUNICIPAL STAFF	68	1	4	3.12	.802
Q10.07 IMPROVED MANUALS AND DESIGN STANDARDS	67	1	4	3.09	.900
Q10.23 MORE REGULATORY FLEXIBILITY WHEN GREEN INFRASTRUCTURE WOULD MEET THE SPIRIT BUT NOT THE LETTER OF THE LAW	61	1	4	3.08	.900
Q10.08 ASSISTANCE WITH CODE REGULATION ENFORCEMENT	63	1	4	3.08	.903
Q10.10 REVISE DOE'S LID CREDIT CALCULATION FOR COMPREHENSIVE HYDROLOGY APPROACH	45	1	4	3.04	.952
Q10.26 DISSEMINATION OF GREEN INFRASTRUCTURE SUCCESS STORIES	67	1	4	3.00	.853
Q10.11 CLEARER DEFINITION OF LID AND 'WHERE FEASIBLE'	64	1	4	2.97	1.038
Q10.22 GUIDANCE ON EFFECTIVE USE OF INCENTIVES, INCLUDING NON-FINANCIAL OPTIONS	61	1	4	2.95	.921
Q10.21 STREAMLINE REVIEW PROCESS AMONG STATE AND FEDERAL AGENCIES	57	1	4	2.95	.953
Q10.16 SUPPORT FOR INTER-JURISDICTIONAL COLLABORATION	61	1	4	2.82	.922
Q10.09 ASSISTANCE WITH REWRITING CODES AND REGULATIONS	62	1	4	2.79	.871

Q10.03 GREEN INFRASTRUCTURE CERTIFICATION PROGRAMS	57	1	4	2.74	.917
Q10.18 IDENTIFICATION OF IMPORTANT SOCIAL FACTORS IN ADOPTION OF GREEN INFRASTRUCTURE	63	1	4	2.71	1.038
Q10.19 MAKING IT MORE DIFFICULT TO BUILD USING TRADITIONAL (GREY) INFRASTRUCTURE	61	1	4	2.67	1.179
Q10.14 TRAINING FOR CONDUCTING IN-HOUSE ECON. ANALYSIS THAT INCLUDE ECOLOGICAL VALUE OF NAT. RESOURCES	59	1	4	2.66	.976
Q10.01 TIGHTER REGULATIONS REQUIRING GREEN INFRASTRUCTURE	60	1	4	2.65	1.162
Q10.24 DEVELOP BEST PRACTICES FOR LID IN AGRICULTURAL SETTINGS	57	1	4	2.60	1.147
Q10.17 MAKING POLITICAL INTERVENTION IN ESTABLISHED PROCESSES MORE DIFFICULT	46	1	4	2.59	1.066
Q10.12 REQUIRE LID IN ALL JURISDICTIONS (INCL. NON-PERMITTEES)	61	1	4	2.57	1.161
Q10.20 ALLOW LIOS MORE CONTROL OF FUNDING RESOURCES	39	1	4	2.13	1.174

## Appendix N

### Descriptive Statistics for Communication

#### Q1. Which of the following best describes the municipality where you work?

- 1 - City
- 2 - County

#### Q14. How would you rate the effectiveness of communication between your current division and the following areas in your municipality?

- 1 – Poor
- 2 – Needs Improvement
- 3 – Good
- 4 – Very Effective

*Table 11.1 Descriptive Statistics for Internal Communication Effectiveness: Total*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	134	1	4	3.17	.790
Q14.04 SURFACE WATER MANAGEMENT	135	1	4	3.14	.865
Q14.11 NATURAL RESOURCES	109	1	4	3.06	.749
Q14.07 MAINTENANCE	144	1	4	2.94	.750
Q14.09 EDUCATION & OUTREACH	122	1	4	2.93	.845
Q14.10 ROADS	142	1	4	2.91	.762
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	143	1	4	2.87	.887
Q14.02 PERMITTING	138	1	4	2.83	.868
Q14.01 PLANNING	141	1	4	2.80	.847
Q14.13 ELECTED MUNICIPAL COUNCIL	142	1	4	2.73	.833
Q14.05 COMMUNITY DEVELOPMENT	129	1	4	2.68	.829
Q14.06 PARKS	141	1	4	2.68	.796
Q14.08 AIRPORT	38	1	4	2.26	.760

*Table 11.2 Descriptive Statistics for Internal Communication Effectiveness: City*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.04 SURFACE WATER MANAGEMENT	93	1	4	3.26	.736
Q14.03 PUBLIC WORKS	96	1	4	3.23	.788
Q14.11 NATURAL RESOURCES	75	1	4	3.16	.754
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	100	1	4	3.00	.865
Q14.01 PLANNING	96	1	4	2.98	.808

Q14.09 EDUCATION & OUTREACH	81	1	4	2.95	.789
Q14.07 MAINTENANCE	98	1	4	2.94	.744
Q14.02 PERMITTING	94	1	4	2.94	.827
Q14.10 ROADS	97	1	4	2.93	.753
Q14.05 COMMUNITY DEVELOPMENT	90	1	4	2.86	.801
Q14.13 ELECTED MUNICIPAL COUNCIL	100	1	4	2.81	.825
Q14.06 PARKS	96	1	4	2.76	.805
Q14.08 AIRPORT	17	1	3	2.06	.748

*Table 11.3 Descriptive Statistics for Internal Communication Effectiveness: County*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	33	2	4	3.03	.770
Q14.07 MAINTENANCE	41	2	4	2.93	.787
Q14.09 EDUCATION & OUTREACH	37	1	4	2.92	.983
Q14.10 ROADS	40	1	4	2.88	.791
Q14.04 SURFACE WATER MANAGEMENT	37	1	4	2.86	1.084
Q14.11 NATURAL RESOURCES	31	1	4	2.84	.735
Q14.02 PERMITTING	39	1	4	2.59	.938
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	39	1	4	2.56	.912
Q14.13 ELECTED MUNICIPAL COUNCIL	38	1	4	2.53	.862
Q14.06 PARKS	40	1	4	2.53	.784
Q14.01 PLANNING	40	1	4	2.38	.807
Q14.08 AIRPORT	19	1	4	2.37	.761
Q14.05 COMMUNITY DEVELOPMENT	34	1	4	2.21	.770

*Table 11.4 Descriptive Statistics for Internal Communication Effectiveness: City and County*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	129	1	4	3.18	.785
Q14.04 SURFACE WATER MANAGEMENT	130	1	4	3.15	.864
Q14.11 NATURAL RESOURCES	106	1	4	3.07	.759
Q14.09 EDUCATION & OUTREACH	118	1	4	2.94	.850
Q14.07 MAINTENANCE	139	1	4	2.94	.754
Q14.10 ROADS	137	1	4	2.91	.762
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	139	1	4	2.88	.897
Q14.02 PERMITTING	133	1	4	2.83	.872
Q14.01 PLANNING	136	1	4	2.80	.850
Q14.13 ELECTED MUNICIPAL COUNCIL	138	1	4	2.73	.842
Q14.06 PARKS	136	1	4	2.69	.803
Q14.05 COMMUNITY DEVELOPMENT	124	1	4	2.68	.841

Q14.08 AIRPORT	36	1	4	2.22	.760
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*Table 11.5 Descriptive Statistics for Internal Communication Effectiveness: Urban*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.04 SURFACE WATER MANAGEMENT	67	1	4	3.30	.697
Q14.11 NATURAL RESOURCES	54	1	4	3.24	.751
Q14.03 PUBLIC WORKS	68	1	4	3.24	.735
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	72	1	4	3.04	.879
Q14.09 EDUCATION & OUTREACH	63	2	4	3.02	.772
Q14.10 ROADS	70	1	4	2.93	.729
Q14.07 MAINTENANCE	70	1	4	2.93	.748
Q14.01 PLANNING	70	1	4	2.91	.830
Q14.02 PERMITTING	66	1	4	2.88	.886
Q14.05 COMMUNITY DEVELOPMENT	65	1	4	2.85	.775
Q14.06 PARKS	68	1	4	2.82	.772
Q14.13 ELECTED MUNICIPAL COUNCIL	71	1	4	2.80	.821
Q14.08 AIRPORT	12	1	4	2.08	.900

*Table 11.6 Descriptive Statistics for Internal Communication Effectiveness: Rural*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	13	2	4	3.15	.801
Q14.02 PERMITTING	13	1	4	3.00	.816
Q14.05 COMMUNITY DEVELOPMENT	12	2	4	3.00	.739
Q14.04 SURFACE WATER MANAGEMENT	12	1	4	2.92	.996
Q14.03 PUBLIC WORKS	11	1	4	2.91	.944
Q14.07 MAINTENANCE	13	1	4	2.85	.801
Q14.11 NATURAL RESOURCES	11	1	4	2.82	.982
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	14	1	4	2.79	.893
Q14.10 ROADS	13	1	4	2.77	.927
Q14.13 ELECTED MUNICIPAL COUNCIL	14	1	4	2.71	.825
Q14.06 PARKS	14	1	4	2.71	.825
Q14.09 EDUCATION & OUTREACH	9	1	4	2.44	.882
Q14.08 AIRPORT	4	1	3	2.00	.816

*Table 11.7 Descriptive Statistics for Internal Communication Effectiveness: Both urban and rural*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	55	1	4	3.15	.826
Q14.04 SURFACE WATER MANAGEMENT	56	1	4	3.00	.991
Q14.07 MAINTENANCE	61	2	4	2.97	.752



Q14.10 ROADS	59	1	4	2.92	.772
Q14.11 NATURAL RESOURCES	44	2	4	2.91	.640
Q14.09 EDUCATION & OUTREACH	50	1	4	2.90	.909
Q14.02 PERMITTING	59	1	4	2.75	.863
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	57	1	4	2.68	.869
Q14.13 ELECTED MUNICIPAL COUNCIL	57	1	4	2.65	.855
Q14.01 PLANNING	58	1	4	2.59	.838
Q14.06 PARKS	59	1	4	2.51	.796
Q14.08 AIRPORT	22	1	3	2.41	.666
Q14.05 COMMUNITY DEVELOPMENT	52	1	4	2.40	.846

*Table 11.8 Descriptive Statistics for Internal Communication Effectiveness: Very Large*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	46	1	4	3.02	.830
Q14.09 EDUCATION & OUTREACH	49	1	4	2.92	.886
Q14.07 MAINTENANCE	53	1	4	2.91	.815
Q14.11 NATURAL RESOURCES	41	1	4	2.90	.768
Q14.04 SURFACE WATER MANAGEMENT	52	1	4	2.88	1.003
Q14.10 ROADS	53	1	4	2.87	.761
Q14.02 PERMITTING	49	1	4	2.67	.899
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	52	1	4	2.65	.926
Q14.13 ELECTED MUNICIPAL COUNCIL	51	1	4	2.55	.923
Q14.06 PARKS	52	1	4	2.48	.804
Q14.01 PLANNING	52	1	4	2.40	.799
Q14.08 AIRPORT	20	1	4	2.40	.681
Q14.05 COMMUNITY DEVELOPMENT	45	1	4	2.36	.773

*Table 11.9 Descriptive Statistics for Internal Communication Effectiveness: Large*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.04 SURFACE WATER MANAGEMENT	38	2	4	3.47	.687
Q14.03 PUBLIC WORKS	41	2	4	3.34	.656
Q14.11 NATURAL RESOURCES	35	2	4	3.20	.719
Q14.09 EDUCATION & OUTREACH	39	2	4	3.08	.807
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	41	1	4	3.02	.821
Q14.07 MAINTENANCE	44	1	4	2.93	.695
Q14.10 ROADS	43	1	4	2.86	.710
Q14.06 PARKS	42	2	4	2.81	.671
Q14.01 PLANNING	44	1	4	2.80	.765
Q14.13 ELECTED MUNICIPAL COUNCIL	41	1	4	2.78	.725

Q14.02 PERMITTING	42	1	4	2.69	.869
Q14.05 COMMUNITY DEVELOPMENT	42	1	4	2.62	.661
Q14.08 AIRPORT	11	1	3	2.18	.751

*Table 11.10 Descriptive Statistics for Internal Communication Effectiveness: Mid-sized*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	34	2	4	3.29	.799
Q14.03 PUBLIC WORKS	36	1	4	3.28	.882
Q14.04 SURFACE WATER MANAGEMENT	36	1	4	3.19	.749
Q14.02 PERMITTING	36	2	4	3.17	.775
Q14.05 COMMUNITY DEVELOPMENT	32	1	4	3.13	.942
Q14.11 NATURAL RESOURCES	25	2	4	3.12	.781
Q14.10 ROADS	35	1	4	3.09	.818
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	38	1	4	2.97	.915
Q14.07 MAINTENANCE	36	1	4	2.97	.774
Q14.13 ELECTED MUNICIPAL COUNCIL	37	1	4	2.84	.834
Q14.09 EDUCATION & OUTREACH	26	1	4	2.81	.849
Q14.06 PARKS	35	1	4	2.74	.950
Q14.08 AIRPORT	5	1	3	2.00	1.000

*Table 11.11 Descriptive Statistics for Internal Communication Effectiveness: Small*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	11	2	4	3.18	.603
Q14.11 NATURAL RESOURCES	8	2	4	3.13	.641
Q14.13 ELECTED MUNICIPAL COUNCIL	13	2	4	3.00	.707
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	12	1	4	3.00	.739
Q14.04 SURFACE WATER MANAGEMENT	9	2	4	3.00	.707
Q14.02 PERMITTING	11	1	4	3.00	.775
Q14.07 MAINTENANCE	11	2	4	3.00	.632
Q14.05 COMMUNITY DEVELOPMENT	10	2	4	3.00	.667
Q14.06 PARKS	12	2	4	2.92	.515
Q14.03 PUBLIC WORKS	11	2	4	2.82	.603
Q14.10 ROADS	11	1	4	2.73	.786
Q14.09 EDUCATION & OUTREACH	8	2	4	2.63	.744
Q14.08 AIRPORT	2	1	3	2.00	1.414

*Table 11.12 Descriptive Statistics for Internal Communication Effectiveness: Phase I NPDES*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	35	2	4	2.91	.702

Q14.11 NATURAL RESOURCES	28	1	4	2.79	.686
Q14.10 ROADS	41	1	4	2.76	.734
Q14.09 EDUCATION & OUTREACH	38	1	4	2.74	.860
Q14.07 MAINTENANCE	42	1	4	2.69	.715
Q14.04 SURFACE WATER MANAGEMENT	40	1	4	2.65	.921
Q14.02 PERMITTING	39	1	4	2.56	.912
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	40	1	4	2.55	.876
Q14.06 PARKS	39	1	4	2.49	.721
Q14.13 ELECTED MUNICIPAL COUNCIL	38	1	4	2.47	.893
Q14.08 AIRPORT	19	1	4	2.37	.761
Q14.01 PLANNING	39	1	4	2.31	.731
Q14.05 COMMUNITY DEVELOPMENT	33	1	4	2.27	.839

*Table 11.13 Descriptive Statistics for Internal Communication Effectiveness: Phase II NPDES*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.04 SURFACE WATER MANAGEMENT	71	2	4	3.52	.629
Q14.03 PUBLIC WORKS	75	2	4	3.43	.681
Q14.11 NATURAL RESOURCES	58	2	4	3.29	.701
Q14.09 EDUCATION & OUTREACH	64	2	4	3.16	.801
Q14.07 MAINTENANCE	76	2	4	3.13	.699
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	77	1	4	3.08	.839
Q14.10 ROADS	76	1	4	2.99	.774
Q14.01 PLANNING	77	1	4	2.97	.811
Q14.02 PERMITTING	74	1	4	2.95	.842
Q14.13 ELECTED MUNICIPAL COUNCIL	76	1	4	2.87	.789
Q14.05 COMMUNITY DEVELOPMENT	73	1	4	2.82	.770
Q14.06 PARKS	76	1	4	2.76	.814
Q14.08 AIRPORT	10	1	3	2.10	.738

*Table 11.14 Descriptive Statistics for Internal Communication Effectiveness: Non-NPDES*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	11	2	4	3.27	.647
Q14.04 SURFACE WATER MANAGEMENT	11	1	4	3.09	.944
Q14.02 PERMITTING	12	2	4	3.08	.515
Q14.10 ROADS	13	2	4	3.08	.641
Q14.05 COMMUNITY DEVELOPMENT	9	1	4	3.00	.866
Q14.07 MAINTENANCE	13	1	4	2.92	.862
Q14.06 PARKS	13	1	4	2.92	.862
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	14	1	4	2.86	.864

Q14.03 PUBLIC WORKS	12	1	4	2.83	1.030
Q14.13 ELECTED MUNICIPAL COUNCIL	15	2	4	2.80	.775
Q14.11 NATURAL RESOURCES	10	2	4	2.70	.675
Q14.09 EDUCATION & OUTREACH	8	2	3	2.38	.518
Q14.08 AIRPORT	2	1	2	1.50	.707

*Table 11.15 Descriptive Statistics for Internal Communication Effectiveness: Region Northwest*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	89	1	4	3.18	.762
Q14.11 NATURAL RESOURCES	75	1	4	3.09	.774
Q14.04 SURFACE WATER MANAGEMENT	89	1	4	3.09	.900
Q14.07 MAINTENANCE	98	1	4	2.89	.716
Q14.10 ROADS	96	1	4	2.85	.781
Q14.09 EDUCATION & OUTREACH	81	1	4	2.85	.823
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	97	1	4	2.84	.932
Q14.02 PERMITTING	91	1	4	2.75	.926
Q14.13 ELECTED MUNICIPAL COUNCIL	96	1	4	2.71	.857
Q14.01 PLANNING	96	1	4	2.69	.862
Q14.06 PARKS	94	1	4	2.68	.793
Q14.05 COMMUNITY DEVELOPMENT	85	1	4	2.66	.894
Q14.08 AIRPORT	29	1	4	2.24	.739

*Table 11.16 Descriptive Statistics for Internal Communication Effectiveness: Region Southwest*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.04 SURFACE WATER MANAGEMENT	40	1	4	3.25	.776
Q14.03 PUBLIC WORKS	39	1	4	3.15	.844
Q14.09 EDUCATION & OUTREACH	36	1	4	3.14	.867
Q14.01 PLANNING	39	2	4	3.10	.754
Q14.07 MAINTENANCE	40	2	4	3.08	.797
Q14.10 ROADS	40	2	4	3.05	.714
Q14.02 PERMITTING	41	2	4	3.05	.705
Q14.11 NATURAL RESOURCES	29	2	4	3.03	.731
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	41	1	4	2.98	.790
Q14.13 ELECTED MUNICIPAL COUNCIL	41	1	4	2.78	.791
Q14.05 COMMUNITY DEVELOPMENT	38	1	4	2.76	.714
Q14.06 PARKS	41	1	4	2.71	.844
Q14.08 AIRPORT	7	1	3	2.14	.900

*Table 11.17 Descriptive Statistics for Internal Communication Effectiveness: Region: Both..*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.04 SURFACE WATER MANAGEMENT	6	2	4	3.17	.983
Q14.03 PUBLIC WORKS	6	2	4	3.17	.983
Q14.08 AIRPORT	2	3	3	3.00	.000
Q14.10 ROADS	6	2	4	2.83	.753
Q14.07 MAINTENANCE	6	2	4	2.83	.983
Q14.13 ELECTED MUNICIPAL COUNCIL	5	2	4	2.80	.837
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	5	2	4	2.80	.837
Q14.11 NATURAL RESOURCES	5	2	3	2.80	.447
Q14.02 PERMITTING	6	2	4	2.67	.816
Q14.01 PLANNING	6	2	4	2.67	.816
Q14.09 EDUCATION & OUTREACH	5	2	4	2.60	.894
Q14.06 PARKS	6	2	3	2.50	.548
Q14.05 COMMUNITY DEVELOPMENT	6	2	3	2.50	.548

*Table 11.18 Descriptive Statistics for Internal Communication Effectiveness: Executive Staff*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	23	2	4	3.48	.730
Q14.02 PERMITTING	23	2	4	3.43	.662
Q14.05 COMMUNITY DEVELOPMENT	22	2	4	3.41	.666
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	24	2	4	3.33	.637
Q14.04 SURFACE WATER MANAGEMENT	22	2	4	3.32	.646
Q14.11 NATURAL RESOURCES	19	2	4	3.21	.713
Q14.03 PUBLIC WORKS	22	1	4	3.18	.853
Q14.13 ELECTED MUNICIPAL COUNCIL	25	2	4	3.12	.726
Q14.07 MAINTENANCE	23	1	4	3.09	.900
Q14.10 ROADS	23	2	4	3.04	.767
Q14.08 AIRPORT	3	2	4	3.00	1.000
Q14.06 PARKS	22	1	4	3.00	.873
Q14.09 EDUCATION & OUTREACH	16	2	4	2.81	.911

*Table 11.19 Descriptive Statistics for Internal Communication Effectiveness: Mid-Management*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.04 SURFACE WATER MANAGEMENT	37	1	4	3.41	.832
Q14.03 PUBLIC WORKS	38	1	4	3.32	.775
Q14.11 NATURAL RESOURCES	29	1	4	3.21	.819
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	40	1	4	3.20	.883
Q14.07 MAINTENANCE	40	1	4	3.20	.723

Q14.09 EDUCATION & OUTREACH	36	1	4	3.17	.811
Q14.10 ROADS	40	1	4	3.08	.694
Q14.13 ELECTED MUNICIPAL COUNCIL	40	1	4	3.00	.877
Q14.01 PLANNING	40	1	4	2.95	.749
Q14.02 PERMITTING	38	1	4	2.92	.850
Q14.06 PARKS	40	1	4	2.73	.816
Q14.05 COMMUNITY DEVELOPMENT	37	1	4	2.68	.784
Q14.08 AIRPORT	8	1	3	2.13	.835

*Table 11.20 Descriptive Statistics for Internal Communication Effectiveness: Line Staff .....*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	61	1	4	3.10	.768
Q14.04 SURFACE WATER MANAGEMENT	64	1	4	3.00	.909
Q14.11 NATURAL RESOURCES	50	1	4	2.94	.767
Q14.09 EDUCATION & OUTREACH	59	1	4	2.85	.867
Q14.10 ROADS	66	1	4	2.80	.749
Q14.07 MAINTENANCE	70	1	4	2.74	.674
Q14.02 PERMITTING	65	1	4	2.63	.840
Q14.06 PARKS	67	1	4	2.61	.738
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	66	1	4	2.58	.842
Q14.01 PLANNING	67	1	4	2.52	.804
Q14.13 ELECTED MUNICIPAL COUNCIL	65	1	4	2.46	.752
Q14.05 COMMUNITY DEVELOPMENT	59	1	4	2.44	.794
Q14.08 AIRPORT	25	1	3	2.16	.688

*Table 11.21 Descriptive Statistics for Internal Communication Effectiveness: Non Municipal Employee*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.08 AIRPORT	1	3	3	3.00	.
Q14.04 SURFACE WATER MANAGEMENT	3	2	4	3.00	1.000
Q14.03 PUBLIC WORKS	2	2	4	3.00	1.414
Q14.02 PERMITTING	2	2	4	3.00	1.414
Q14.01 PLANNING	2	2	4	3.00	1.414
Q14.13 ELECTED MUNICIPAL COUNCIL	3	2	3	2.67	.577
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	3	2	3	2.67	.577
Q14.11 NATURAL RESOURCES	3	2	3	2.67	.577
Q14.07 MAINTENANCE	2	2	3	2.50	.707
Q14.05 COMMUNITY DEVELOPMENT	3	2	3	2.33	.577
Q14.10 ROADS	3	2	2	2.00	.000
Q14.09 EDUCATION & OUTREACH	2	2	2	2.00	.000

Q14.06 PARKS	3	2	2	2.00	.000
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**Q12. Municipal Structure: Which of the following best describes the municipal division(s) where you work? Check all that apply.**

*Table 11.22 Descriptive Statistics for Internal Communication Effectiveness: Planning*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	36	2	4	3.28	.659
Q14.04 SURFACE WATER MANAGEMENT	39	2	4	3.21	.695
Q14.02 PERMITTING	36	2	4	3.17	.655
Q14.11 NATURAL RESOURCES	30	2	4	3.17	.747
Q14.05 COMMUNITY DEVELOPMENT	34	2	4	3.12	.686
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	40	1	4	3.05	.815
Q14.09 EDUCATION & OUTREACH	31	2	4	3.00	.856
Q14.03 PUBLIC WORKS	39	1	4	3.00	.725
Q14.10 ROADS	39	2	4	2.95	.647
Q14.13 ELECTED MUNICIPAL COUNCIL	40	1	4	2.88	.757
Q14.06 PARKS	39	1	4	2.82	.756
Q14.07 MAINTENANCE	39	1	4	2.79	.732
Q14.08 AIRPORT	6	2	3	2.50	.548

*Table 11.23 Descriptive Statistics for Internal Communication Effectiveness: Permitting*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.02 PERMITTING	37	2	4	3.24	.597
Q14.04 SURFACE WATER MANAGEMENT	40	1	4	3.23	.768
Q14.01 PLANNING	39	2	4	3.18	.721
Q14.03 PUBLIC WORKS	38	1	4	3.13	.777
Q14.09 EDUCATION & OUTREACH	32	1	4	3.03	.933
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	42	1	4	3.02	.780
Q14.11 NATURAL RESOURCES	29	2	4	3.00	.802
Q14.05 COMMUNITY DEVELOPMENT	37	1	4	2.92	.795
Q14.10 ROADS	39	1	4	2.90	.754
Q14.07 MAINTENANCE	41	1	4	2.85	.760
Q14.13 ELECTED MUNICIPAL COUNCIL	42	1	4	2.79	.813
Q14.06 PARKS	41	1	4	2.73	.742
Q14.08 AIRPORT	6	2	3	2.67	.516

*Table 11.24 Descriptive Statistics for Internal Communication Effectiveness: Engineering*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	57	1	4	3.28	.774
Q14.04 SURFACE WATER MANAGEMENT	57	1	4	3.21	.840
Q14.10 ROADS	56	2	4	3.11	.705
Q14.11 NATURAL RESOURCES	35	1	4	3.06	.906
Q14.09 EDUCATION & OUTREACH	51	1	4	3.00	.872
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	60	1	4	2.97	.920
Q14.07 MAINTENANCE	60	1	4	2.95	.746
Q14.02 PERMITTING	58	1	4	2.83	.819
Q14.01 PLANNING	61	1	4	2.82	.806
Q14.13 ELECTED MUNICIPAL COUNCIL	59	1	4	2.78	.852
Q14.06 PARKS	59	1	4	2.73	.762
Q14.05 COMMUNITY DEVELOPMENT	58	1	4	2.69	.730
Q14.08 AIRPORT	12	1	3	2.17	.577

*Table 11.25 Descriptive Statistics for Internal Communication Effectiveness: Public Works*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	74	1	4	3.34	.745
Q14.04 SURFACE WATER MANAGEMENT	76	1	4	3.13	.943
Q14.10 ROADS	79	1	4	3.03	.784
Q14.11 NATURAL RESOURCES	59	1	4	3.00	.809
Q14.07 MAINTENANCE	82	1	4	3.00	.754
Q14.09 EDUCATION & OUTREACH	69	1	4	2.94	.938
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	79	1	4	2.94	.896
Q14.02 PERMITTING	78	1	4	2.78	.832
Q14.01 PLANNING	84	1	4	2.77	.841
Q14.06 PARKS	82	1	4	2.73	.817
Q14.13 ELECTED MUNICIPAL COUNCIL	79	1	4	2.70	.853
Q14.05 COMMUNITY DEVELOPMENT	75	1	4	2.61	.837
Q14.08 AIRPORT	23	1	3	2.17	.717

*Table 11.26 Descriptive Statistics for Internal Communication Effectiveness: Surface Water Management*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.04 SURFACE WATER MANAGEMENT	65	1	4	3.38	.764
Q14.03 PUBLIC WORKS	68	2	4	3.19	.718
Q14.11 NATURAL RESOURCES	50	1	4	3.14	.756
Q14.09 EDUCATION & OUTREACH	63	1	4	3.08	.829
Q14.07 MAINTENANCE	73	2	4	3.04	.676
Q14.10 ROADS	72	1	4	2.97	.712



Q14.12 MUNICIPAL MANAGER/EXECUTIVE	70	1	4	2.97	.816
Q14.13 ELECTED MUNICIPAL COUNCIL	70	1	4	2.80	.809
Q14.01 PLANNING	75	1	4	2.80	.805
Q14.02 PERMITTING	70	1	4	2.80	.827
Q14.06 PARKS	72	1	4	2.74	.750
Q14.05 COMMUNITY DEVELOPMENT	68	1	4	2.60	.775
Q14.08 AIRPORT	16	1	3	2.25	.577

*Table 11.27 Descriptive Statistics for Internal Communication Effectiveness: Community Development*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	21	2	4	3.43	.598
Q14.02 PERMITTING	23	2	4	3.30	.635
Q14.05 COMMUNITY DEVELOPMENT	22	2	4	3.27	.703
Q14.04 SURFACE WATER MANAGEMENT	23	2	4	3.26	.689
Q14.11 NATURAL RESOURCES	16	2	4	3.25	.775
Q14.03 PUBLIC WORKS	24	2	4	3.21	.658
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	25	1	4	3.20	.866
Q14.13 ELECTED MUNICIPAL COUNCIL	25	1	4	3.12	.781
Q14.08 AIRPORT	3	3	3	3.00	.000
Q14.10 ROADS	23	2	4	2.96	.562
Q14.07 MAINTENANCE	23	2	4	2.91	.668
Q14.09 EDUCATION & OUTREACH	16	2	4	2.88	.806
Q14.06 PARKS	25	1	4	2.84	.688

*Table 11.28 Descriptive Statistics for Internal Communication Effectiveness: Parks*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.11 NATURAL RESOURCES	14	2	4	3.29	.726
Q14.03 PUBLIC WORKS	17	2	4	3.24	.664
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	16	2	4	3.06	.772
Q14.09 EDUCATION & OUTREACH	13	2	4	3.00	.913
Q14.01 PLANNING	18	2	4	3.00	.767
Q14.05 COMMUNITY DEVELOPMENT	18	2	4	2.94	.725
Q14.13 ELECTED MUNICIPAL COUNCIL	17	2	4	2.94	.748
Q14.07 MAINTENANCE	17	2	4	2.94	.659
Q14.04 SURFACE WATER MANAGEMENT	17	2	4	2.94	.748
Q14.06 PARKS	15	2	4	2.93	.704
Q14.02 PERMITTING	17	1	4	2.88	.781
Q14.10 ROADS	16	1	4	2.81	.750
Q14.08 AIRPORT	3	2	3	2.67	.577

*Table 11.29 Descriptive Statistics for Internal Communication Effectiveness: Maintenance*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	26	2	4	3.23	.710
Q14.04 SURFACE WATER MANAGEMENT	25	2	4	3.20	.707
Q14.11 NATURAL RESOURCES	20	2	4	3.15	.813
Q14.09 EDUCATION & OUTREACH	23	1	4	3.09	.900
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	24	1	4	3.00	.834
Q14.07 MAINTENANCE	26	2	4	3.00	.748
Q14.02 PERMITTING	25	2	4	2.96	.611
Q14.01 PLANNING	28	2	4	2.93	.716
Q14.13 ELECTED MUNICIPAL COUNCIL	26	1	4	2.88	.766
Q14.10 ROADS	25	1	4	2.80	.707
Q14.05 COMMUNITY DEVELOPMENT	26	1	4	2.65	.745
Q14.06 PARKS	26	2	4	2.65	.745
Q14.08 AIRPORT	4	2	3	2.50	.577

*Table 11.30 Descriptive Statistics for Internal Communication Effectiveness: Airport*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.11 NATURAL RESOURCES	2	3	4	3.50	.707
Q14.13 ELECTED MUNICIPAL COUNCIL	3	2	4	3.33	1.155
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	3	2	4	3.33	1.155
Q14.08 AIRPORT	3	3	4	3.33	.577
Q14.03 PUBLIC WORKS	4	2	4	3.25	.957
Q14.02 PERMITTING	4	2	4	3.25	.957
Q14.10 ROADS	4	3	3	3.00	.000
Q14.06 PARKS	4	2	4	3.00	.816
Q14.01 PLANNING	4	2	4	3.00	.816
Q14.07 MAINTENANCE	4	2	4	2.75	.957
Q14.05 COMMUNITY DEVELOPMENT	4	2	4	2.75	.957
Q14.09 EDUCATION & OUTREACH	3	2	4	2.67	1.155
Q14.04 SURFACE WATER MANAGEMENT	4	2	3	2.50	.577

*Table 11.31 Descriptive Statistics for Internal Communication Effectiveness: Education & Outreach*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.09 EDUCATION & OUTREACH	28	2	4	3.43	.742
Q14.04 SURFACE WATER MANAGEMENT	28	2	4	3.43	.742
Q14.11 NATURAL RESOURCES	23	2	4	3.35	.714

Q14.03 PUBLIC WORKS	29	2	4	3.28	.751
Q14.07 MAINTENANCE	31	1	4	2.94	.892
Q14.10 ROADS	30	2	4	2.87	.730
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	31	1	4	2.84	.969
Q14.01 PLANNING	30	1	4	2.83	.986
Q14.05 COMMUNITY DEVELOPMENT	30	1	4	2.80	.887
Q14.02 PERMITTING	28	1	4	2.75	.967
Q14.06 PARKS	31	1	4	2.74	.855
Q14.13 ELECTED MUNICIPAL COUNCIL	30	1	4	2.47	.819
Q14.08 AIRPORT	5	1	2	1.80	.447

*Table 11.32 Descriptive Statistics for Internal Communication Effectiveness: Roads*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.03 PUBLIC WORKS	21	1	4	3.24	.831
Q14.10 ROADS	19	2	4	3.11	.658
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	21	1	4	3.05	.865
Q14.04 SURFACE WATER MANAGEMENT	22	1	4	3.00	.816
Q14.01 PLANNING	24	1	4	2.96	.806
Q14.11 NATURAL RESOURCES	16	1	4	2.94	.929
Q14.13 ELECTED MUNICIPAL COUNCIL	22	1	4	2.91	.811
Q14.02 PERMITTING	22	1	4	2.91	.684
Q14.07 MAINTENANCE	22	1	4	2.82	.733
Q14.06 PARKS	22	1	4	2.73	.703
Q14.05 COMMUNITY DEVELOPMENT	21	1	4	2.67	.796
Q14.08 AIRPORT	8	2	3	2.63	.518
Q14.09 EDUCATION & OUTREACH	18	1	4	2.61	.916

*Table 11.33 Descriptive Statistics for Internal Communication Effectiveness: Natural Resources*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.11 NATURAL RESOURCES	30	2	4	3.33	.758
Q14.04 SURFACE WATER MANAGEMENT	31	2	4	3.23	.805
Q14.03 PUBLIC WORKS	30	2	4	3.13	.776
Q14.09 EDUCATION & OUTREACH	25	2	4	3.04	.889
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	30	1	4	2.83	.950
Q14.01 PLANNING	30	1	4	2.73	.828
Q14.07 MAINTENANCE	32	1	4	2.72	.772
Q14.06 PARKS	31	2	4	2.71	.739
Q14.05 COMMUNITY DEVELOPMENT	29	1	4	2.69	.891
Q14.10 ROADS	31	1	4	2.68	.832

Q14.13 ELECTED MUNICIPAL COUNCIL	30	1	4	2.67	.844
Q14.02 PERMITTING	29	1	4	2.62	.903
Q14.08 AIRPORT	11	1	3	2.09	.701

*Table 11.34 Descriptive Statistics for Internal Communication Effectiveness: Municipal Manager/Executive*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	18	2	4	3.50	.618
Q14.11 NATURAL RESOURCES	14	2	4	3.43	.756
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	19	2	4	3.37	.597
Q14.03 PUBLIC WORKS	19	2	4	3.37	.684
Q14.04 SURFACE WATER MANAGEMENT	18	2	4	3.28	.669
Q14.02 PERMITTING	18	2	4	3.28	.669
Q14.13 ELECTED MUNICIPAL COUNCIL	20	2	4	3.20	.616
Q14.05 COMMUNITY DEVELOPMENT	18	1	4	3.06	.938
Q14.06 PARKS	17	2	4	3.00	.707
Q14.08 AIRPORT	3	3	3	3.00	.000
Q14.07 MAINTENANCE	19	2	4	3.00	.667
Q14.10 ROADS	18	1	4	2.94	.725
Q14.09 EDUCATION & OUTREACH	13	1	4	2.92	1.038

*Table 11.35 Descriptive Statistics for Internal Communication Effectiveness: Elected Officials*

Item	N	Minimum	Maximum	Mean	Std. Deviation
Q14.01 PLANNING	12	2	4	3.42	.669
Q14.03 PUBLIC WORKS	11	2	4	3.36	.674
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	11	2	4	3.27	.647
Q14.11 NATURAL RESOURCES	9	2	4	3.22	.833
Q14.13 ELECTED MUNICIPAL COUNCIL	11	2	4	3.00	.632
Q14.08 AIRPORT	3	3	3	3.00	.000
Q14.04 SURFACE WATER MANAGEMENT	11	2	4	3.00	.775
Q14.02 PERMITTING	11	2	4	3.00	.775
Q14.05 COMMUNITY DEVELOPMENT	11	2	4	2.91	.701
Q14.07 MAINTENANCE	10	2	4	2.90	.568
Q14.06 PARKS	11	2	4	2.82	.603
Q14.09 EDUCATION & OUTREACH	10	1	4	2.80	1.135
Q14.10 ROADS	9	2	4	2.78	.667

*Table 11.36 Descriptive Statistics for Internal Communication Effectiveness: Other*

Item	N	Minimum	Maximum	Mean	Std. Deviation
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Q14.04 SURFACE WATER MANAGEMENT	9	2	4	3.11	.782
Q14.11 NATURAL RESOURCES	8	2	4	3.00	.535
Q14.08 AIRPORT	2	3	3	3.00	.000
Q14.03 PUBLIC WORKS	8	2	4	3.00	.756
Q14.12 MUNICIPAL MANAGER/EXECUTIVE	8	2	3	2.88	.354
Q14.01 PLANNING	7	2	4	2.86	.900
Q14.02 PERMITTING	7	2	4	2.71	.951
Q14.10 ROADS	8	2	4	2.63	.744
Q14.13 ELECTED MUNICIPAL COUNCIL	7	1	3	2.57	.787
Q14.07 MAINTENANCE	7	2	3	2.57	.535
Q14.06 PARKS	9	2	3	2.44	.527
Q14.09 EDUCATION & OUTREACH	8	2	3	2.38	.518
Q14.05 COMMUNITY DEVELOPMENT	6	2	3	2.33	.516

## Appendix O

### Factor Analysis

This appendix employs factor analysis to deduce how many factors, or principal components, may be identified from each of the checkbox item categories. For instance, Q6 is composed of 25 items, none of which are mutually exclusive. In such a case, the only meaningful statistics we can derive from the dataset are related to how multiple items might be collapsed into components. Factor, or principal component, analysis explains any variance observed within a larger group of variables and allows the researcher to get at “the observed patterns of association in the data determine the factor solution” (Lattin, Carol, & Green, 2003).

The first step in factor analysis is to produce descriptive statistics about the dataset. Beginning with “Q6. Which of the following examples of green infrastructure policy and/or projects has your community successfully implemented? Check all that apply,” we arrive at the Table 12.1 below.

*Table 12.1 Factor Analysis: Descriptive Statistics: Successful Implementation Projects*

Item	N	Mean	Std. Deviation
Q6.02 CRITICAL AREAS ORDINANCES	216	.81	.397
Q6.09 RAIN GARDENS/BIOINFILTRATION	216	.76	.426
Q6.06 SHORELINE MASTER PROGRAM	216	.72	.451
Q6.17 CURB-SIDE RECYCLING	216	.69	.464
Q6.04 PERVIOUS PAVEMENT	216	.67	.471
Q6.14 ENVIRONMENTAL EDUCATION	216	.66	.474
Q6.22 BIKE PATHS & LANES	216	.65	.477
Q6.13 TREE PRESERVATION	216	.65	.479
Q6.01 HABITAT RESTORATION	216	.65	.479
Q6.18 ROUNDABOUT(S)	216	.55	.499
Q6.03 UPDATED CODES & REG'S TO ALLOW FOR LID	216	.53	.500
Q6.15 SOCIAL MARKETING/PUBLIC BEHAVIOR CHANGE CAMPAIGNS	216	.48	.501
Q6.10 COMMUNITY GARDEN(S)	216	.48	.501
Q6.23 DEMONSTRATION PROJECT(S)	216	.46	.499
Q6.11 GREEN CERTIFICATIONS	216	.46	.499
Q6.24 FLOOD PLAIN RESTORATION	216	.34	.474
CURB-SIDE COMPOSTING	216	.34	.474
Q6.12 CLUSTER DEVELOPMENT	216	.33	.471
Q6.21 SOFT SHORELINE PROTECTION	216	.30	.460
Q6.08 GREEN ROOF(S)	216	.30	.458

Q6.19 NARROW &/OR CURBLESS ROADS	216	.29	.453
Q6.05 WILDLIFE CORRIDORS	216	.28	.449
Q6.07 ENDANGERED SPECIES RECOVERY PLAN(S)	216	.25	.434
Q6.20 ECONOMIC ANALYSES	216	.16	.369
Q6.25 OTHER	216	.06	.247

The mean values in the table above are computed based on the fact all of the Q6 items were recoded to 0s and 1s so that a binary relationship exists between an answer and non-answer (i.e., choosing the item by checking the box vs. ignoring the item). The closer the mean is to 1, the more “importance” imputed to that variable. For example, the mean value for Q6.02 CRITICAL AREAS ORDINANCES is .81. From this value, we can conclude that more respondent communities have successfully implemented Critical Area Ordinances as examples of green infrastructure policy and/or projects than have not. In this way, the mean becomes a sort of index value we can use during the interpretation phase.

Next, we look at two measures of reliability for the analysis: Kaiser-Meyer-Olkin (KMO) and Bartlett’s Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.882
Bartlett’s Test of Sphericity	Approx. Chi-Square 1599.198
	df 300
	Sig. .000

*Table 12.2 KMO and Bartlett’s Test: Item Q6*

Like Cronbach’s Alpha, we are looking for a KMO > 0.70. The range .7 to .8 is good, >= .9 is excellent. Our KMO above is close enough to .9 that it may be considered excellent. This allows us to reject the null hypothesis based on the value.882. Further, the closer Bartlett’s test is to < .05, the better. In this case, we cannot get much lower than 0.00, so we are going to reject the null hypothesis here, as well. Both of these mean we can confidently consider the factors discovered to be reliable.

Since Varimax rotation was used to obtain the following values, we arrive at the rotated component matrix in Table 12.3 below.

*Table 12.3 Rotated Component Matrix: Item Q6*

Item	Component					
	1	2	3	4	5	6
Q6.01 HABITAT RESTORATION	.479	.437	.165	.229	-.220	.057
Q6.02 CRITICAL AREAS ORDINANCES	.270	.027	.149	.720	.120	.007
Q6.03 UPDATED CODES & REG’S TO ALLOW FOR LID	.379	.223	.022	.242	.513	.171
Q6.04 PERVIOUS PAVEMENT	.640	.205	.079	.167	.016	-.070
Q6.05 WILDLIFE CORRIDORS	.361	.524	-.141	.147	.194	-.009

Q6.06 SHORELINE MASTER PROGRAM	.179	.106	.178	.739	.104	.118
Q6.07 ENDANGERED SPECIES RECOVERY PLAN(S)	.134	.740	.125	.076	.030	-.080
Q6.08 GREEN ROOF(S)	.473	.275	.392	-.160	.189	-.027
Q6.09 RAIN GARDENS/BIOINFILTRATION	.618	-.020	.145	.253	.172	.081
Q6.10 COMMUNITY GARDEN(S)	.325	-.102	.623	.069	.107	-.076
Q6.11 GREEN CERTIFICATIONS	.547	.216	.505	-.079	.137	-.040
Q6.12 CLUSTER DEVELOPMENT	.141	.420	.099	.397	.241	-.136
Q6.13 TREE PRESERVATION	.666	.153	.082	.165	.154	.013
Q6.14 ENVIRONMENTAL EDUCATION	.578	.317	.217	.115	-.003	-.115
Q6.15 SOCIAL MARKETING/PUBLIC BEHAVIOR CHANGE CAMPAIGNS	.351	.465	.212	.064	-.199	.147
Q6.16 CURB-SIDE COMPOSTING	.115	.218	.662	.149	.053	.083
Q6.17 CURB-SIDE RECYCLING	.197	.125	.616	.334	.102	-.002
Q6.18 ROUNDABOUT(S)	.341	.247	.033	.518	-.328	-.230
Q6.19 NARROW &/OR CURBLESS ROADS	.086	.111	.271	.115	.735	-.112
Q6.20 ECONOMIC ANALYSES	.204	.667	.004	-.110	.144	.047
Q6.21 SOFT SHORELINE PROTECTION	.056	.520	.298	.251	.119	-.028
Q6.22 BIKE PATHS & LANES	.620	.019	.143	.260	-.018	-.245
Q6.23 DEMONSTRATION PROJECT(S)	.604	.210	.199	.100	.039	.210
Q6.24 FLOOD PLAIN RESTORATION	-.047	.429	.370	.203	-.264	-.051
Q6.25 OTHER	-.027	-.039	-.004	.023	-.027	.907

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

This illustrates how the 25 items of Q6 were collapsed into 6 principal components. Next, we must examine the loadings for each component in the rotated component matrix (Table 12.3 above). Significant loadings are highlighted for each item within each factor in Table x above and the Q6 items are summarized by factor below:

**Factor 1:** Q6.01 HABITAT RESTORATION, Q6.04 PERVIOUS PAVEMENT, Q6.08 GREEN ROOF(S), Q6.09 RAIN GARDENS/BIOINFILTRATION, Q6.11 GREEN CERTIFICATIONS, Q6.13 TREE PRESERVATION, Q6.14 ENVIRONMENTAL EDUCATION, Q6.22 BIKE PATHS & LANES, Q6.23 DEMONSTRATION PROJECT(S)

**Factor 2:** Q6.05 WILDLIFE CORRIDORS, Q6.07 ENDANGERED SPECIES RECOVERY PLAN(S), Q6.12 CLUSTER DEVELOPMENT, Q6.15 SOCIAL MARKETING/PUBLIC BEHAVIOR CHANGE CAMPAIGNS, Q6.20 ECONOMIC ANALYSES, Q6.21 SOFT SHORELINE PROTECTION, Q6.24 FLOOD PLAIN RESTORATION

**Factor 3:** Q6.10 COMMUNITY GARDEN(S), CURB-SIDE COMPOSTING, Q6.17 CURB-SIDE RECYCLING

**Factor 4:** Q6.02 CRITICAL AREAS ORDINANCES, Q6.06 SHORELINE MASTER PROGRAM, Q6.18 ROUNDABOUT(S)



**Factor 5:** Q6.03 UPDATED CODES & REG'S TO ALLOW FOR LID, Q6.19 NARROW &/OR CURBLESS ROADS

**Factor 6:** Q6.25 OTHER

This is where the art part of data interpretation enters the scene. As one considers the factor groupings above, it is observed a tacit, or somewhat hidden, factor linking them together. For instance, Factor 4 involves community gardens and curbside recycling and composting. The tacit linkage here might be the fact that gardens and curbside recycling and composting are all sustainable green practices. This illustrates how someone with even rudimentary study knowledge may still make the principal component links in a logical way based upon what they think constitutes green practices. Further interpretation of these factors is available in the interpretation section below.

The main utility of factor analysis is the ability to collapse multiple variables into a few components. Typically, this is a common practice when hundreds, or even thousands, of variables are generated by a survey study. In the case of this study, the number of variables, while not trivial, is not so unwieldy that collapsing many of them into single components is used in subsequent analyses; they are, though, used as a way for the researchers to validate their assumptions about response groupings within the dataset.

### Q12 Factor Analysis

First, we consider the descriptive statistics for Q12:

*Table 12.4 Descriptive Statistics: Municipal Division Affiliations of Respondents*

Item	N	Mean	Std. Deviation
Q12.04 PUBLIC WORKS	216	.39	.490
Q12.05 SURFACE WATER MANAGEMENT	216	.36	.480
Q12.03 ENGINEERING	216	.29	.453
Q12.02 PERMITTING	216	.20	.404
Q12.01 PLANNING	216	.20	.400
Q12.12 NATURAL RESOURCES	216	.15	.356
Q12.10 EDUCATION & OUTREACH	216	.15	.356
Q12.08 MAINTENANCE	216	.13	.337
Q12.06 COMMUNITY DEVELOPMENT	216	.12	.326
Q12.11 ROADS	216	.11	.315
Q12.13 MUNICIPAL MANAGER/ EXECUTIVE	216	.09	.291
Q12.07 PARKS	216	.09	.284
Q12.15 OTHER	216	.06	.230
Q12.14 ELECTED OFFICIALS	216	.06	.230
Q12.09 AIRPORT	216	.02	.135

Next, we take a look at the KMO and Bartlett's test for the dataset:

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.812
Bartlett's Test of Sphericity	Approx. Chi-Square 1211.066
	df 105
	Sig. .000

*Table 12.5 KMO and Bartlett's Test: Item Q12*

The KMO measure is well within our desired range and Bartlett's significance value both look good, so we reject the null hypothesis and move on to looking at the principal components:

*Table 12.6 Rotated Component Matrix: Q12*

Item	Component			
	1	2	3	4
Q12.01 PLANNING	.390	.691	-.140	.382
Q12.02 PERMITTING	.418	.624	.022	.244
Q12.03 ENGINEERING	.155	.112	.707	.251
Q12.04 PUBLIC WORKS	.182	-.029	.789	.089
Q12.05 SURFACE WATER MANAGEMENT	.094	.256	.724	-.043
Q12.06 COMMUNITY DEVELOPMENT	.557	.517	-.118	.367
Q12.07 PARKS	.745	.251	.147	.006
Q12.08 MAINTENANCE	.582	.356	.367	-.249
Q12.09 AIRPORT	.463	-.045	.038	.289
Q12.10 EDUCATION & OUTREACH	.036	.687	.360	-.192
Q12.11 ROADS	.723	.006	.367	.119
Q12.12 NATURAL RESOURCES	.018	.708	.185	-.074
Q12.13 MUNICIPAL MANAGER/ EXECUTIVE	.728	.243	.103	-.039
Q12.14 ELECTED OFFICIALS	.781	.074	.075	-.137
Q12.15 OTHER	.073	-.027	-.217	-.718

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

The item Q12 presents four factors over 15 items grouped as:

Factor 1: Q12.06 COMMUNITY DEVELOPMENT, Q12.07 PARKS, Q12.08 MAINTENANCE, Q12.09 AIRPORT, Q12.11 ROADS, Q12.13 MUNICIPAL MANAGER/ EXECUTIVE, Q12.14 ELECTED OFFICIALS

Factor 2: Q12.01 PLANNING, Q12.02 PERMITTING, Q12.10 EDUCATION & OUTREACH, Q12.12 NATURAL RESOURCES

Factor 3: Q12.03 ENGINEERING, Q12.04 PUBLIC WORKS, Q12.05 SURFACE WATER MANAGEMENT

Factor 4: Q12.15

## Q13 Factor Analysis

First, a look at the Q13 descriptive statistics:

*Table 12.7 Factor Analysis: Descriptive Statistics: Survey Respondents & their Municipal Functions*

Item	N	Mean	Std. Deviation
Q13.01 STORMWATER MANAGEMENT	216	.58	.494
Q13.04 WATER QUALITY	216	.52	.501
Q13.05 LID	216	.49	.501
Q13.03 HABITAT	216	.31	.464
Q13.02 ENDANGERED SPECIES	216	.24	.429
Q13.06 SMP	216	.18	.386
Q13.07 OTHER	216	.14	.347

Then, a peek at the KMO and Bartlett's Test results for Q13:

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.737
Bartlett's Test of Sphericity	Approx. Chi-Square	534.456
	df	21
	Sig.	.000

*Table 12.8 KMO and Bartlett's Test: Item Q13*

Both tests look good, so we will reject the null hypothesis and proceed with the rotated component matrix.

*Table 12.9 Rotated Component Matrix: Item Q13*

Item	Component	
	1	2
Q13.01 STORMWATER MANAGEMENT	.901	.115
Q13.02 ENDANGERED SPECIES	.161	.849
Q13.03 HABITAT	.275	.821
Q13.04 WATER QUALITY	.847	.198
Q13.05 LID	.855	.064
Q13.06 SMP	.093	.776
Q13.07 OTHER	-.002	.199

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

The list of factors produced is smaller based on the smaller dataset.

Factor 1: Q13.01 STORMWATER MANAGEMENT, Q13.04 WATER QUALITY, Q13.05 LID

Factor 2: Q13.02 ENDANGERED SPECIES, Q13.03 HABITAT, Q13.06 SMP, Q13.07