

The Municipality of Anchorage  
Watershed Management Services

# **Green Infrastructure & Low Impact Development Implementation Strategy**

**Update February 2017**



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## **1. Introduction and Strategy Purpose**

The Municipality of Anchorage (MOA) is implementing a Green Infrastructure (GI) program to treat and manage runoff from the first 0.52 inches of rainfall. The GI program will require and promote the use of Low Impact Development (LID) and GI techniques on new development and redevelopment projects. The purpose of this Implementation Strategy is to provide a guidance document that identifies existing challenges to implementing GI and LID within the Municipality of Anchorage (MOA) and provide a proposed method for addressing and overcoming those challenges.

The GI and LID Implementation Plan was originally developed in 2015. This updated strategy reflects the current status of implementing the MOA GI program, provides updated milestones and timelines, and incorporates new requirements per the most current Alaska Pollution Discharge Elimination System (APDES) permit for Anchorage.

### **1.1. APDES Permit Requirements**

Incorporating LID and GI in development and redevelopment projects in the MOA is currently a requirement of the joint MOA and Alaska Department of Transportation (ADOT) stormwater discharge permit under the APDES program. This permit is issued by the Alaska Department of Environmental Conservation (ADEC). The current APDES permit, issued in June of 2015, requires implementation of a control program that establishes stormwater management measures to treat and manage the first 0.52 inches of rainfall preceded by 24 hours of no precipitation. The permit further requires an updated strategy to provide incentives for the increased use of GI/LID in private and public sector projects.

As the MOA has been working toward implementing an LID/GI strategy, the design and development community presented several technical problems and unanswered questions associated with incorporating retention and related LID and GI techniques. Many of these issues are centered on Anchorage's cold climate and associated infrastructure maintenance practices. Rather than attempt full implementation without addressing these issues, ADEC granted the MOA the opportunity to prepare and execute this Implementation Strategy to provide a pathway for addressing the community's concerns.

## **2. What is LID and GI?**

Development and urbanization affect both the quantity and quality of stormwater runoff. Development increases peak flows and runoff volumes while concurrently increasing both the concentration and types of pollutants carried by runoff. Urban development within a watershed has a number of direct impacts on downstream waters and waterways including changes to stream flow, changes to stream geometry, and degradation of aquatic habitat.

LID and Green Infrastructure are terms given to a way of development that seeks to minimize disruption of an area's natural hydrology. LID works with nature to manage stormwater runoff as close to its source as possible, instead of collecting and disposing of stormwater as quickly as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective impervious surfaces, and allowing vegetation and soil to provide natural cleaning and filtration. The LID approach seeks to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product. There are many practices that have

been used to achieve to these principles such as bioretention facilities, infiltration facilities, vegetated filter strips, vegetated rooftops, rain barrels, and permeable pavements.

### **3. Addressing the Issues**

As mentioned in Section 1 of this document, the Anchorage design and development community has presented several technical concerns with incorporating LID and GI. These include the following:

1. Local Site Constraints
2. LID Causing Damage to Roadways
3. Lack of Performance Record
4. Conflicting MOA Policies
5. Lack of Public Knowledge
6. New Development vs. Re-Development
7. Phasing in Existing Projects
8. Maintenance Concerns
9. Lack of DCM Familiarity

Each of these items are discussed in detail below.

#### **3.1. Local Site Constraints**

Problem. Development and re-development in Anchorage present many physical site constraints that can be seen as a barrier to implementing LID. These constraints include poorly infiltrating soils, shallow bedrock, high groundwater tables, extreme space constraints, utility conflicts, and heavy sediment accumulation from wintertime sanding activities. These types of challenges are present on many or most development and re-development projects in Anchorage.

Proposed Solution. To address these concerns, the MOA has developed adaptive design criteria that include various stormwater management controls intended to work successfully in many of these types of conditions. For example, for poorly infiltrating soils, facilities like rain gardens can be designed with perforated underdrains to collect excess water and carry it away instead of allowing water to pond or cause localized flood. The MOA's new stormwater management design criteria manual was released to the public for comment in the spring of 2015. Comments were received and incorporated, and the criteria manual is currently in the process of being reviewed and adopted by the Anchorage Assembly. This process requires additional review by MOA departments, the Planning and Zoning Commission, local community councils, and the Assembly itself.

The MOA also recognizes that in some cases, GI/LID implementation will not be feasible or practical. For cases with multiple constraining elements, such as extreme space constraints *and* a high groundwater table, LID techniques may not be the best way to provide water quality protection. For cases where LID is not feasible, the MOA has included an allowance for more traditional forms of water quality treatment. The process for determining if GI/LID is not feasible is outlined in the new criteria manual, as required per the APDES permit.

Over the course of the this APDES permit, the MOA and ADOT will complete at least five LID demonstration projects to demonstrate successful application of LID in Anchorage. WMS continues to look for project

opportunities that will address on-site constraints and demonstrate successful ways to overcome them. The completed demonstration projects will then be monitored so that design criteria and practices can be adapted to best suit various site constraints. These projects and the resulting performance monitoring will also be publicized as much as possible to maximize the benefit of lessons learned. Public education and outreach is discussed further in section 3.5 of this document.

### **3.2. LID Causing Damage to Roadways**

Problem: Roadway designers both within the MOA and in the public design community have expressed concern regarding the feasibility of LID and GI within public roadways and with managing stormwater within or near roadway structural sections. There is concern that infiltrated water can cause damage to the structural section, particularly because of Anchorage’s freeze-and-thaw cycles, which tend to cause roadway heaving and cracking even under normal development scenarios. Current responsible engineering practice emphasizes that stormwater runoff should be directed away from roadways as quickly as possible. The concept of slowing runoff and managing it near a roadway has caused alarm for many designers.

Roadway designers are also concerned with conflicting demands for space within right-of-way areas that are fairly narrow. It is becoming more difficult to accommodate increasing traffic volumes, federal and local safety requirements, and the demand for multi-use corridors. In many locations in Anchorage, widening a narrow right-of-way would be detrimental to surrounding businesses and residential homes. In many cases, surface space is not available for LID and GI facilities, and subsurface facilities are either infeasible based on constraints such as groundwater depth, or the designers are concerned with structural integrity of the roadway as discussed above.

Proposed Solutions. The MOA is working toward a three-part solution to the concerns with LID and GI in roadways.

1. Many other jurisdictions across the US have experienced success with LID and roadways, but few of these applications experience Anchorage’s frost depths (approximately 10 feet on average for a cleared roadway) or the repeating freeze-thaw cycle that Anchorage commonly experiences in the spring and the fall. Examples from other cold climate states such as Minnesota and New Jersey indicate that LID in roadways can be successful if it is applied appropriately. The MOA needs to demonstrate this through successful completion of roadway demonstration project(s). Roadway GI/LID demonstration project(s) will help determine which applications are best-suited for roadway use, and provide a local example for concerned designers. The MOA continues to actively seek opportunities for GI/LID demonstration projects on municipal road projects and to continuing educating roadway designers on the appropriate applications of various LID techniques. The WMS section of the MOA is working with project managers in Public Works to find a municipal road project that can be used as an LID demonstration project. Concurrently, ADOT&PF demonstration projects are also roadway applications.
2. The MOA has developed an incentive for roadways to incorporate LID. For cases where LID is feasible along most of a roadway length, but not the entire length, the incentive allows the roadway treatment to focus on treatment for the feasible areas without being penalized for the rest. This essentially eliminates the need for duplicate stormwater treatment systems (both LID and traditional treatment), making LID more feasible and decreasing the overall treatment cost.

3. The MOA has identified a relationship between right-of-way width and feasibility of LID/GI in roadways. Generally, LID and GI can be quite successful in cases where adequate space is available in the right-of-way, especially in cases where the transportation infrastructure (driving lines, pedestrian access, etc.) do not take up the entire ROW width. For roadway projects that have a ROW width greater than 60 feet, the MOA has developed a program that will analyze GI feasibility on a case-by-case basis. Feasibility determination will be based on specific site conditions so that conclusions can be drawn regarding applicability of various types of GI techniques under a wide range of local roadway development conditions. This program is part of the new DCM and will become effective once the DCM is fully adopted by the MOA.

### **3.3. Lack of Performance Record**

Problem: Designers and project owners throughout the Anchorage community have presented the concern that LID techniques are new in Anchorage and that project longevity and performance record are not known. Without data to demonstrate that LID techniques can meet the project’s proposed design life, engineers, project managers, and developers hesitate to include LID in their designs and budgets. This is especially true for capital projects that are publicly funded. There is a perception that using public funds for LID is not responsible.

Proposed Solutions. Despite public perception, many projects that have used LID techniques have been completed in Anchorage over the past 20 years. Most of these projects are private-sector projects, and they are not well-known. The MOA has maintained a formal LID performance tracking program since 2012. This program initially focused on MOA and ADOT&PF pilot projects, and has recently expanded to include various private sites as well. To continue expanding the performance knowledge of various LID application, the MOA is continuing to include both public and private sector projects in the monitoring program. The results of the performance monitoring are summarized in an annual report, and the lessons learned from the monitoring are shared through various public outreach platforms, including the Annual Watershed Update.

The MOA has also formed a committee called the Green Infrastructure Working Group (GIWG). The GIWG is made up of community professionals in disciplines such as engineering, landscape architecture, arboriculture, and planning. This committee compiled a list and assisted in creation of a map of existing GI/LID projects in Anchorage. The map can be found at the link below, and it is being used as a resource for examples of in-the-ground installations.

<http://www.anchoragestormwater.com/maps.html>

The GI group members also provided information about the performance of several existing projects based on periodic performance monitoring on a volunteer basis. This information was summarized in the 2015 LID Monitoring Report and is being used as a reference for expected performance of various GI/LID applications.

### **3.4. Conflicting MOA Policies**

Problem. Many private-sector designers have expressed concerns that LID requirements conflict with other MOA development requirements. For example, if stormwater is directed into a bioretention facility, the bioretention facility will require vegetation that can withstand alternating wet and dry conditions and can provide appropriate pollutant uptake. In many cases, these types of plants are not included as MOA-approved landscaping vegetation.

If the plants do not meet landscaping requirements, the bioretention facility does not “count” as landscaping and the designer lacks adequate space to include additional landscaped areas.

Proposed Solution. For these types of situations, the MOA has developed alternative-compliance allowances in local code and in the new DCM. If a project encounters MOA regulations that are conflicting with LID application, WMS will provide a pathway for project approval through alternative compliance. The alternative compliance program will also alert WMS to new LID projects that are candidates for performance monitoring, as discussed in Section 3.3 above. This program was developed in the previous permit term and will be implemented in 2017, with the release of the new criteria manual.

### **3.5. Lack of Public Knowledge**

Problem. Anchorage’s design and development community remains largely unaware of the purpose, need, design, and construction considerations related to LID. Successful implementation of LID requires careful consideration of site details and construction methods and sequencing. For example, if heavy construction equipment is driven over areas that are intended to be used for infiltration, the soil will compact, and its infiltrative capacity will decrease. Poor construction practices also skew project performance monitoring because measured conditions are not reflective of design assumptions. During construction of the MOA’s current demonstration projects, it became evident that additional education and outreach is needed for engineers, contractors, developers, and other stormwater professionals.

Proposed Solution. The MOA is proposing three components to a solution for this problem.

1. *Construction Considerations Plan.* The new stormwater criteria manual includes a requirement for designers to provide contractors with a Construction Considerations Plan (CCP) for LID facilities. The CCP will identify and discuss specific construction activities, considerations, and proposed order for any proposed GI/LID facilities that are included in the design. To aid designers in developing this plan, the new criteria manual includes a discussion of common construction considerations for each GI/LID tool presented in the manual. The designer will then tailor this list to reflect the actual site conditions for each project.
2. *GI/LID Construction Considerations Course for Contractors and Designers.* The MOA will develop and host a training course for contractors and engineers that discusses basic construction considerations related to LID construction. This course will discuss the lessons learned from other projects and encourage discussion of additional considerations based on the participants’ field experience. The course is expected to help designers in developing construction consideration plans and to aid contractors in appropriate construction of GI/LID facilities.
3. *MOA GI/LID Inspector Training.* The MOA will develop and implement a training course for municipal inspectors who will be visiting sites during construction of GI/LID facilities. The class will focus on recognizing potential construction pitfalls and how to identify facility problems in the field.

In addition to these measures, the MOA has previously completed public LID trainings for design professionals and will continue to provide public education through the very successful Annual Watershed Update.

### **3.6. New Development vs. Redevelopment**

Problem. Several designers have expressed a concern that GI/LID is only feasible for new development projects and is not feasible for redevelopment. The APDES permit and the new stormwater criteria manual require GI/LID to be implemented for both cases.

Proposed Solution. This concern is similar to the concern regarding lack of performance record for LID projects, which is discussed in Section 3.3. The MOA will continue to diffuse this concern through successful redevelopment demonstration projects and highlighting private sector redevelopment projects that use LID techniques successfully.

### **3.7. Phasing in Existing Projects**

Problem. The design and development community has expressed concern over how existing or phased projects would come into compliance with the new regulations. For example, if a project was started in 2016 under the old criteria, and is not completed until 2017 when the new criteria are released, it would be problematic for the project to comply with the new requirements.

Proposed Solution. The MOA is currently developing alternatives for how this can be handled. One option is to allow an introductory period of time where project designers can choose which criteria to follow, the old or the new. This is similar to the way the MOA introduced the new municipal code, Title 21.

### **3.8. Maintenance Concerns**

Problem. Local maintenance personnel and designers have expressed concern regarding the frequency and type of maintenance that will be needed for LID facilities. Because most people are not familiar with these types of facilities, there is concern that the work will exceed maintenance capabilities and budgets for both private and public facilities. Additionally, just as Anchorage does not have a long-term LID performance record, we also do not have a long-term maintenance record for LID facilities. The relationship between facility life expectancy and maintenance frequency is also a concern.

Proposed Solution. The MOA recognizes that maintenance is a critical component of a successful LID program in Anchorage. To help facilitate appropriate and reasonable maintenance requirements, WMS has involved the MOA street maintenance personnel in the development of the new criteria manual as much as possible. The new criteria manual is developed with the intent to minimize maintenance needs. A “recommended maintenance” discussion has been added to the criteria for each stormwater control. This section is based on research from other communities and on feedback from local stormwater professionals. It includes both recommended activity and the frequency it should generally occur.

The MOA is also planning to incorporate maintenance tracking into the LID monitoring program. In this way, facility performance could be related to both the type and frequency of maintenance activities. Interviewing maintenance personnel would also provide valuable insight regarding common facility issues that could potentially be mitigated during design.

The MOA is considering a future education program for maintenance personnel and is looking for opportunities to improve communication between maintenance personnel and designers.



### **3.9. Lack of DCM Familiarity**

Problem. Much of the MOA’s GI/LID strategy relies on successful implementation of the new stormwater design criteria manual (DCM). During both public and internal MOA review of the draft DCM, it became apparent that changing the existing drainage criteria is going to cause some confusion. Users do not always recognize/locate the appropriate resources available in this large manual, and tend to resort back to the “status quo” of the outdated criteria.

Proposed Solution. The MOA will hold DCM training courses for both internal MOA staff and public users of the manual. This should help familiarize the MOA review staff with regulatory changes, and help the public manual users have clear expectations of what is required for various types of projects. The MOA started this public education program in 2015, and will continue it to ensure that the final adopted form of the DCM is clearly understood by various user groups.

### **3.10. Summary of Challenges**

Through working with design and development professionals in Anchorage, the MOA has identified several obstacles to successful GI/LID implementation. These obstacles can be overcome through implementation of the measures identified in this document. A brief summary of the challenges and proposed solutions is provided in the table below.

**Milestones and Issue Resolution**

Item No.	Milestone	Completed	Target Completion	Issue Resolution
1	DCM Adoption			Local Site Constraints
	a. Planning and Zoning Approval		Spring 2017	Conflicting MOA Policies
	b. Assembly Approval		Spring 2017	Maintenance Concerns
2	Demonstration Projects		Ongoing	Local Site Constraints LID Causing Damage to Roadways New Development vs. Redevelopment
3	LID Monitoring program		Ongoing	Lack of Performance Record Maintenance Concerns New vs. Redevelopment
4	Develop Design Incentives	✓		LID Causing Damage to Roadways Lack of Performance Record
5	Feasibility and ROW Width Relationship	✓		LID Causing Damage to Roadways
6	GIS Map of Existing Projects	✓		Lack of Performance Record
7	Construction Considerations Plan requirements	✓		Lack of Engineering and Construction Knowledge
8	Training for Designers/Contractors		Fall 2017	Lack of Engineering and Construction Knowledge
9	Training for Inspectors		Fall 2017	Lack of Engineering and Construction Knowledge
10	MOA Staff Training		Fall 2017	Lack of DCM Familiarity
11	Public Training		Fall 2017	Lack of DCM Familiarity
12	DCM Implementation		2017-2018	Phasing in Existing Projects

#### 4. Incentives for Increased use of LID

As mentioned in Section 1 of this plan, the current APDES permit requires an updated strategy for incentivizing the increased use of LID and GI techniques. The MOA researched incentive programs offered by other cities across the country and found that most jurisdictions with incentive programs also operate some type of stormwater utility. Incentives are typically achieved through the reduction or waiver of various types of fees or user costs charged by the utility. Because Anchorage is not able to offer those types of monetary incentives, the MOA is developing and incorporating two other types of incentives, described below.

1. Design incentives. The new criteria manual for GI/LID facilities promotes the use of these facilities to the maximum extent practicable. Examples of design incentives include the 20% area allowance for roadways (as discussed in section 3.2), the removal of the current extended detention requirement if GI/LID is used for stormwater treatment, removal of a requirement that mandated a costly hook-up to municipal storm drainage facilities even if stormwater was fully managed onsite, and the opportunity for alternative compliance (as discussed in section 3.4).
2. Rain Garden Program. The MOA Rain Garden Program will reimburse half of the cost of building a rain garden or other low impact development feature (up to \$750 for residential applications and up to \$5,000 for a commercial site). Through this program, the MOA is also offering design and construction information/assistance to designers and builders to help ensure that these facilities perform as well as possible.