

Low Impact Development (LID)

Implementation and Site
Development of NAVFAC
Projects

- **A set of stormwater management strategies for maintaining or restoring the natural hydrologic functions of a site.**

- Strategies can be natural or man-made
- Includes site design strategies and decentralized source control techniques to limit runoff (Integrated Management Practices).
- Primarily focused on the infiltration, evaporation, transpiration, and reuse of rainwater.
- A revised philosophy intended to reduce runoff rate and volume, and improve quality at the source



A (Very) Brief History of LID



- **Began in Prince George's Co, MD with the use of bioretention cells in 1990's.**
- **This led to incorporating LID into the County's resource protection program.**
- **Prince George's County produced the first municipal LID manual in 1998.**
- **Later expanded into a nationally distributed document in 2000.**
- **Initial LID UFC released in 2004**
- **Penn memo and EISA were released in 2007**
- **Revised LID UFC 2009 (pending)**
 - **Expected to receive tri-services designation in 2010**
- **Executive order 13514 (Oct. 5, 2009)**
- **Final EPA guidance (Dec. 8, 2009) -**
<http://www.epa.gov/owow/nps/lid/section438/#techguid>
- **OSD Policy Jan 2010**
- **UFC 3-210-10N placed on WBDG (ITG) Apr 2010**

Why is LID Required on NAVFAC Projects?



- **Energy Independence and Security Act (EISA) Section 438**
- **Penn Memo**
- **DoD/Navy/FEC Policy**
- **Clean Water Act (CWA) and NPDES Ph2 (state permitting)**
- **NAVFAC Engineering & Construction Bulletin (12 Dec 2007) provides strategies for obtaining LEED Silver (to meet ASN I&E Memo of Aug 2006) and identifies required 20 – 22 credit points, including credits SS6.1 and SS6.2**
- **LID features can help satisfy CWA, LID, and LEED requirements**



- **ASN (I&E) BJ Penn implemented policy on 16 Nov 2007 (known as the Penn memo)**
- **Stated objective of “no net increase in stormwater runoff volume and sediment of nutrient loading from major renovation and construction projects.”**
 - **Policy takes effect FY 2011, however “all efforts shall be made to incorporate LID practices in FY’s 08, 09, and 10.”***
 - **Major renovations with a stormwater component exceeding \$5M**
 - **Major construction exceeding \$750K**
 - **Authorized a waiver process**
 - **Requires annual reporting**

- **Definition**

- “**Sec. 438. Storm Water Runoff Requirements for Federal Development Projects.** The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow.”

- **Applies to ALL federally funded projects that increase impervious area by 5,000sf or more (includes redevelopment)**

- New construction
 - Additions
 - New pavements (including sidewalk)
 - Redevelopment of a site with > 5,000sf of impervious area

- **Design objective is to maintain the pre-development hydrology**

- Pre-development conditions wrt temperature, rate, volume, and duration

- **Use modeling or other recognized tools to establish objective**

- TR-55 curve number method is recommended for Navy projects

- **Document design and construction costs**

- **Complete a post construction analysis of features**

- **Technical constraint examples:**

- On site stormwater retention would have adverse impact on receiving body
- Infiltration potential is limited due to soils, bedrock, water table, underground structures, or contaminated soils
- Water harvesting is not practical or possible due to site or regulatory constraints
- Plumbing or structural systems in building being modified preclude compliance
- Regulatory restriction on use of green infrastructure

- **When a defensible exception is granted stormwater practices must be implemented to facilitate stormwater infiltration, evapo-transpiration, and/or harvesting to the “maximum extent technically feasible”.**

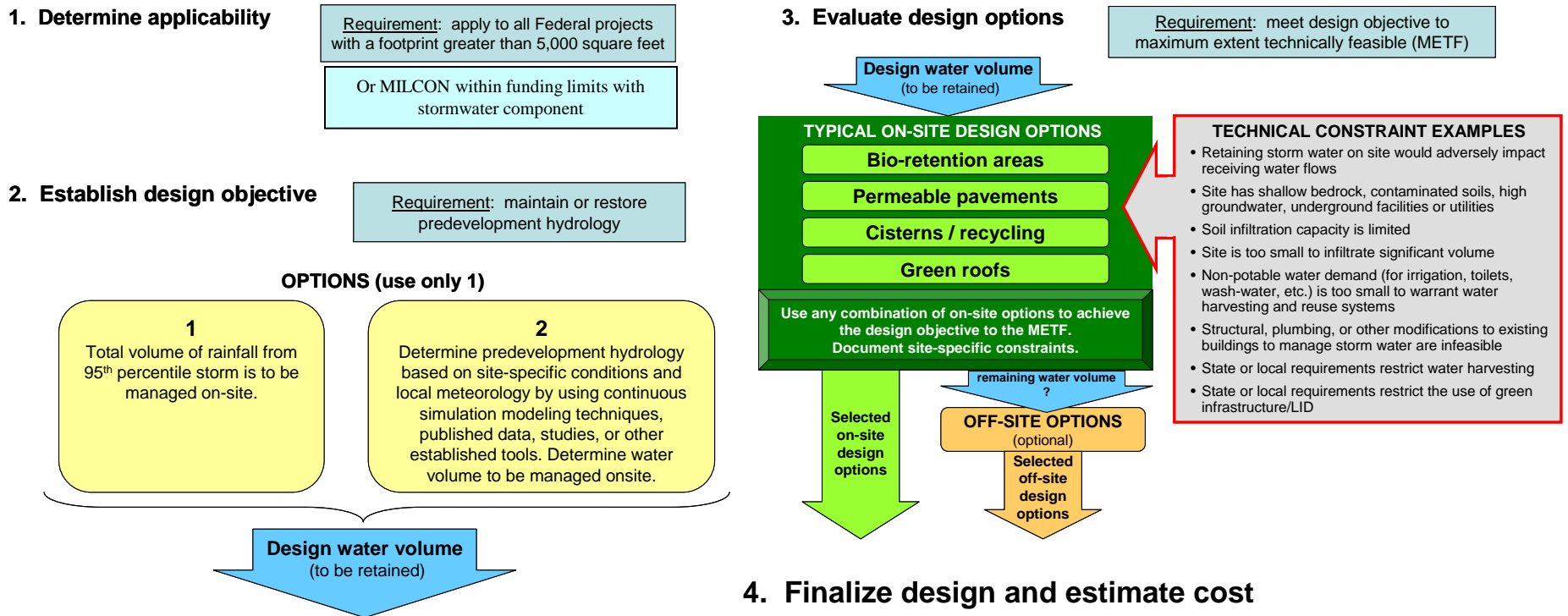
- The difference between the METF amount and the 95th percentile amount shall be detained to ensure no increase in peak runoff rate, and treated to ensure no increase in receiving stream temperature.

- **Exceptions (waivers) do not:**

- Waive criteria wholesale
- Absolve the project from state permitting or LEED requirements

Exception/waiver process will vary based on FEC and should be discussed with PM. Do not assume an exception will be granted based solely on above listed items

EISA DoD Implementation Process



- **Replaces 2004 version**
- **References Penn Memo and EISA as standards**
- **Directs DOR to apply criteria of governing permit authority**
- **Reinforces the requirements of obtaining permits, unless an MOU is on file**
- **Establishes the basis for calculations by defining hierarchy of standards and a recognized pre-development condition.**
 - Definition of Pre-Development is conditions immediately prior to beginning construction*
- **Requires a site design narrative**
- **References the NRCS CN methodology for runoff and volume calculations**
- **Defines the rainfall for use in LID volume calculation**
 - Larger of 95th percentile rainfall, or required water quality depth as design storm
- **Provides guidance on use of integrated management practices (IMP's)**
 - If state or local IMP standards are unavailable the National LID Manual (developed by PG County) can be used.
- **Navy Guidance Document**
 - Provides assistance on interpretation and implementation of LID criteria
- **Technical Memos**
 - Define “No Net Increase in Stormwater Runoff Volume”

***Note – This document is currently is draft form and considered for NAVFAC use only. NAVFAC Atlantic is currently pursuing Tri-Services adoption (2010)**

- **Process is currently being defined**
 - Currently reported through EV
- **Recommended document compliance (narrative)**
 - Pre and post development conditions (incl soils)
 - Site constraints
 - 95th percentile rainfall calculations or source
 - Calculations
 - IMP's used on site
 - Waiver, if applicable
 - Permitting and regulatory requirements
 - Design and construction costs
 - Operation and maintenance protocols for the systems

Credit SS6.1

–Option 1 – Existing impervious area is less than or equal to 50%

- Post development peak discharge and quantity cannot exceed predevelopment discharge and quantity for the one year and two year 24hr storms, or
- Ensure receiving stream does not erode

–Option 2 – Existing impervious area is greater than 50%

- Reduce the volume of runoff by 25% for the 2-year 24-hr storm

Credit SS6.2

- Reduce 80% of the average post development TSS from 90% of the runoff.**

- **UFC 3-200-10N Civil Engineering**
- **UFC 3-210-10 Low Impact Development**
- **UFC 4-010-01 Minimum Anti-Terrorism Standards for Buildings**
- **LEED Requirements**
- **Base Exterior Architectural Plan (BEAP), or equivalent**
- **Federal, State, and local (limited applicability) laws**

- **It is understood there are going to be some conflicts between some criteria.**
 - **New UFC will address conflicts in general**
 - **UFC's will be revised to ensure compatibility**

- **The Designer of Record remains responsible for obtaining all applicable permits.**
- **This may lead to multiple sets of stormwater management calculations**
 - May also require some discussions with permit authority
 - Must determine most stringent requirement for design

MidLant Examples

- **Hampton Roads IPT**
 - DCR is the regulator in Virginia
 - MS4 covers installations and annexes, including NNSY, in Hampton Roads
 - Permitting submitted to Regional Environmental Group Water Program Manager.
- **North Carolina IPT**
 - NC DENR is the NC regulating authority in NC.
 - The region and process will vary by base.
- **Northeast IPT (CT, ME, NH, NJ, PA, and RI)**
 - Regulator varies by state

Always consult your regional environmental engineer for permitting requirements when permitting a project or writing an RFP.

- **New Requirements (FY11)**

- No net increase in volume or sediment loading
- Infiltrate or reuse the calculated LID volume to the METF
- Waiver request, if applicable (varies by FEC)
- Enhanced stormwater narrative

- **Changes on the horizon**

- Modifications to internal reporting process may change information required in narrative
- UFC 3-210-10 acceptance by Tri-Services

LID Integrated Management Practices (IMP) Categories



5 IMP Categories

• Site Utilization

- Reducing the impervious footprint
- Mimic predevelopment hydrologic conditions
- Increase T_c

• Filtration

- Natural water quality treatment and increase T_c

• Interception/Infiltration

- Key strategies to compliance

• Retention of LID Volumes

• Structural Solutions

- The last line of defense
- Come with a higher cost

- Minimize Impervious Areas
- Bioretention
- Soil Amendments
- Filter Strips
- Vegetated Buffers
- Grassed Swales
- Dry Wells
- Infiltration Basins/Trenches
- Inlet Pollution Removal Devices
- Rainwater Harvesting (Rain Barrels and Cisterns)
- Tree Box Filters
- Vegetated Roofs
- Permeable Pavers



- **More impacts on site selection**

- Adequate area for IMP's
- Consider construction type

- **Capital costs**

- Most cost effective in the suburban environment where large undeveloped sites with dedicated land and green spaces are made available as part of the development.
- Urban environment implementation has potentially greater initial and life cycle costs due to more engineered features, though limitations on achieved results will be incurred.

- **Long term maintenance**

- If not maintained, LID features will fail to provide intended quality and quantity controls, which could result in localized flooding, mosquito breeding grounds, and trash/debris collection.
- Requires a commitment to resolute maintenance over the facility life to ensure effectiveness
- Maintenance costs are directly related to complexity of features being constructed.
- Not much cost data on implementation in urban settings

LID: Cost and Schedule Factors



Percent Impervious	Cost Factor (Applied to total site costs & features)	Time Factor	Typical IMP Strategies
75% - 90%	1.20	<ul style="list-style-type: none"> •Permit Process Extended. •Additional time required for Design and Construction. 	Cisterns, Green roof, Water reuse, Pervious pavement, Vertical construction, Parking garages
60% - 75%	1.15	<ul style="list-style-type: none"> •Additional time required for Permit Process •Additional Design time 	Cisterns, Water reuse, Bioretention/filters, Tree boxes, Vertical construction
50% - 60%	1.10	<ul style="list-style-type: none"> •No additional time required for Permit Process 	Cisterns, Bioretention/filters, Tree boxes, Bio-swales
30% - 50%	1.00	<ul style="list-style-type: none"> •No additional time required for Permit Process 	Bioretention/filters, Tree boxes, Bio-swales
<30%	0.90	<ul style="list-style-type: none"> •No additional time required for Permit Process 	Bioretention/filters, Bio-swales

*Note: if green roof is required it is not included in the costs above and should be added on a case by case basis.

- **SWM permitting is primarily concerned with peak runoff rate and quality, and is governed by state requirements**
- **LEED**
 - v2.2 SS6.1 regulates the peak discharge rate and quantity of the 1-yr and 2-yr storm
 - v2.2 SS6.2 requires the treatment of 90% of the average annual rainfall
- **EISA Section 438 goal is to return a site to it's pre-project hydrologic condition.**
- **Penn memo – no net increase in volume**

Generally the Soil Conservation Service (SCS) curve number (CN) method will be used to generate treated volume as a function of pre-development and post-development peak runoff.

The design storm for calculations shall be the larger of the 95th percentile rainfall depth or the locally legislated required water quality depth.

- www.lid-stormwater.net
- **Low Impact Development Interim Guidance**
- **LEED v2.2 Reference Manual**
- **TR-55 Manual**
- **Technical Guidance on Implementing Section 438 of Energy Independence and Security Act, February 2009**
- **NC DENR BMP Manual**
- **The Texas Manual on Rainwater Harvesting**

Thank You!