Agenda

SECTION 1 - Blueprint Columbus
SECTION 2 - Stormwater Strategic Plan
SECTION 3 - GI Implementation & Design Guidelines
SECTION 4 - Future of Blueprint and GI Guidelines
Blueprint Columbus?

- It’s a Better Way!
SECTION 1
BLUEPRINT COLUMBUS ORGANIZATION
Columbus’ Wet Weather Plan

- Two consent orders with Ohio EPA (SSO, CSO)
- Wet Weather Management Plan (WWMP) submitted July 1, 2005
  - WWTP expansion – peak capacities increased by 50% at each plant
  - CSO tunnel – 20 foot tunnel under construction to address a significant number of CSOs
  - $1B spent
A Better Way: Blueprint Columbus

- Remaining Wet Weather Management Plan is oriented to SSOs
- Increasing stormwater regulations were not part of the original plan
- Blueprint Columbus is a new plan that will address both SSOs and Stormwater
  - An Integrated Plan
- OEPA granted permission to delay major consent order projects (SSO tunnel)
Blueprint Columbus Benefits

- Neighborhood improvements – gardens, porous sidewalks, trees, mini parks (with porous basketball courts), vacant homes
- Increased home values (lateral renewal and beautification)
- Creates more opportunities for local contractors and consultants
- Permanent local maintenance jobs
- Getting ahead of anticipated stormwater rules
- I/I work will provide extended asset life
- Cleaner waterways
Organization of the Plan

- Affordability Analysis: Black & Veatch
- Green Workforce Development: T&M
- Collection System Model: Arcadis
- Community Engagement: Brown and Caldwell
- Stormwater Strategic Plan: CDM Smith
- Legal Services: Columbus
- Quick Hits:
  - Third Avenue
  - Barthman-Parsons
  - Clintonville (6 sub areas)
  - Real Time Control
  - DSR 83 Weir Raise
  - CEPT

CEPA Interaction
Suburban Outreach
City Advisory Board
Steering Committee
SECTION 2

PILOT PROJECTS
Clintonville Pilot Area

- Mandatory lateral lining and sewer main lining
- Voluntary Sump Pump Program
- Mandatory and select roof leader redirection
- Green Infrastructure in right-of-way
Organization of the Plan

- Affordability Analysis
  - Black & Veatch
- Green Workforce Development
  - T&M
- Collection System Model
  - Arcadis
- Community Engagement
  - Brown and Caldwell
- Stormwater Strategic Plan
  - CDM Smith
- Legal Services
  - Columbus
- Quick Hits
  - Third Avenue
  - Barthman-Parsons
  - Clintonville (6 sub areas)
  - Real Time Control
  - DSR 83 Weir Raise
  - CEPT
  - Various Stages

OEPA Interaction
Suburban Outreach
City Advisory Board
Steering Committee
SECTION 2

THE STORMWATER STRATEGIC PLAN
Stormwater Strategic Plan

Scope:
1. Stakeholder Education
2. Federal / State SW Regulations
3. LOS / COS
4. Green Infrastructure
5. Triple Bottom Line Analysis
6. Program Support
SECTION 3

GREEN INFRASTRUCTURE IMPLEMENTATION & DESIGN GUIDELINES
### Green Infrastructure Functional Classifications

<table>
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<th>GI Practice</th>
<th>Secondary Functions</th>
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2 City of Columbus, Department of Public Utilities, Division of Sewerage and Drainage, Stormwater Drainage Manual, 2012

3 Ohio Department of Natural Resources, Division of Soil and Water Conservation, Rainwater and Land Development Manual, Ohio’s Standards for Stormwater Management Land Development and Urban Stream Protection

4 With engineered drainage structure

5 Without engineered drainage structure
History

• Stormwater Drainage Manual (SWDM)
  – Primary mechanism to regulate post-construction runoff in compliance with the MS4 permit

• GI Design Guidelines
  – Developed through direction from Blueprint Columbus
  – Supplemented the SWDM
  – Design guidance for site-specific physical and structural components necessary to install a GI facility into a fully developed site or into the public Right-of-Way (ROW)
Guidelines Goals

• The intent of the *GI Design Guidelines* is to:
  – Provide considerations for the placement and design of GI in ROW and retrofit of existing urban environments
  – Provide building blocks for the standard component designs within GI facilities
• The guidelines incorporate existing City and State standards
• The guidelines reference techniques from other cities that have successfully integrated GI into their communities
Developing Guidelines with a Vested Design Community

- Gap analysis of existing design criteria
- Design charette identifying guidance needed
- Technical reviews from design community
- Technical design workshops to identify latest accepted design practices
SECTION 3
GREEN INFRASTRUCTURE IMPLEMENTATION & DESIGN GUIDLINES
Green Infrastructure Design & Implementation Guidelines (March 2014)

• Guidelines published in March 2014
• Intended to be a living document with annual updates
• Section 1: GI Site Evaluation and Development
• Section 2: GI Placement Guidelines and Design Components
• Section 3: Construction Approach*
• Section 4: Operations and Maintenance*
• Section 5: Exceptions to Existing Criteria*
• Section 6: Standard Unit Costs*
• Section 7: Typical Details*
SECTION 1

GI Implementation and Design Guidelines
Step 1: GI design and implementation process

1. Assemble Site Information
   - Maps
   - Existing Utility Locations
   - Landuse and Zoning
   - Traffic and Pedestrians
   - Existing Vegetation
   - Soils and Groundwater

2. Review Local and State Design Guides
   - Stormwater Drainage Manual
   - Public Utilities Standard Drawings
   - Approved Manufacturer's List
   - City of Columbus Department of Public Utilities
   - Ohio Department of Natural Resources
   - Ohio Department of Transportation
   - City of Columbus Department of Public Service

3. Design GI Facility
   - Compute Required Capture Volume and Size GI Facility
   - Locate GI Facility
   - Select Design Components
   - Develop Operation and Maintenance Plan

4. Obtain Approvals

5. Construction

6. Maintenance
Step 2: Review Local and State Design Guides

- City of Columbus
  - Guidelines
  - Department of Public Utilities (DPU)
  - Department of Public Service (DPS)
  - Recreation and Parks Department
- Ohio Department of Natural Resources (ODNR)
- Ohio Department of Transportation (ODOT)
Step 3: Design GI Facility

- Determine capture and/or treatment volume and size facility
- Locate GI facility
- Select Design Components
- Develop Operation and Maintenance Plan (under development)
- Develop GI monitoring design considerations (under development)
GI Design Guidelines

SECTION 2
Section 2: GI Placement Guidelines and Design Components

- Intended to compliment the SWDM
- Provide general guidelines on the placement and design of individual GI features
- Includes two main sections:
  - Placement Guidelines
  - Design Components
- Show typical layouts of GI in the ROW and considerations that should be taken during design of these facilities
- Represent general GI placement, not restrictive of type of GI to be implemented in a given location
- Refer to the specific design components for requirements for individual GI features
Placement Guidelines

Typical Stormwater Green Infrastructure in R/W - Placement Guidelines

Neighborhood with Curb and Gutter

February, 2014

CDM Smith

The City of Columbus
Department of Public Utilities

BLUEPRINT Columbus
Green spaces. Strong neighborhoods.
Placement Guidelines

Coded Notes:

1. When proposing GI feature at intersections, mature plant height shall not exceed 3 ft to avoid sight-line obstructions within the sight triangle, per ODOT Location & Design manual current volume, or as otherwise directed by the City of Columbus DPL, Division of Planning & Operations.

General Notes:

- When proposing GI feature in close proximity to water mains, avoid placing adjacent to or across from hydrants. Avoid also positioning valves within GI feature footprint.
- When proposing GI feature near utility poles and/or street light poles, whenever possible maintain separation from utility poles and/or street light poles. Avoid locating GI feature in proximity to electrical vaults' settings or electrical conduit pull boxes.
- Avoid where possible locating a GI facility above underground public and/or private utilities. If unavoidable, utility sleeves, anti-seep collars & below-grade banks may be required. (See DC 7.4 & 1.3)

Legend:

- DC: Design Component
- D: Designated Parking Area
- VI: Vegetated GI Facility
- VS: Vegetated Stormwater

Typical Stormwater Green Infrastructure in R/W - Placement Guidelines

Neighborhood with ditch section

February, 2014

CDM Smith
Placement Guidelines

General Notes:

1. When proposing GI features in close proximity to water bodies, ensure proper placement adjacent to or as close to public streets. Avoid locating utility facilities, drainage facilities, and existing stormwater conveyances directly adjacent to public streets.

2. When proposing GI features within the rights-of-way, ensure proper placement adjacent to or as close to public streets. Avoid locating utility facilities, drainage facilities, and existing stormwater conveyances directly adjacent to public streets.

3. When proposing GI features in close proximity to public streets, ensure proper placement adjacent to or as close to public streets. Avoid locating utility facilities, drainage facilities, and existing stormwater conveyances directly adjacent to public streets.

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GI Design Components

- Building blocks for the features required within a GI facility
  - Description
  - Where to use
  - Specifications
  - Submittal checklist
  - Details
  - Photos
2.4—BELOW GRADE INLETS

DESCRIPTION: Below grade inlets consists of disconnecting existing downsputs that are discharging to the curb line or curb and gutter underdrain, and reconfiguring to route stormwater runoff to the GI facility. Depending on the existing and desired outlet grade of the downsput, this can be done using a series of pipe fittings to discharge at or above the surface grade of the GI, or to connect to a pop-up drainage emitter below the surface of the GI.

WHERE TO USE: Downspout connections can be used anytime it is desired to divert flow to a GI facility from the existing downsput that is discharging to the street or the curb and gutter underdrain. When the downsput is shallow enough to discharge at or above the GI surface, flow should be diverted by cutting the existing downsput and directing with pipe fittings, as necessary. When the downsput elevation is lower than the proposed GI surface grade, a pop-up emitter may be installed to divert flow to the GI.

SPECIFICATIONS:

- For downsput piping discharging directly to the GI without use of pipe fittings, cut the existing downsput pipe parallel to adjacent grade. Edges shall be deburred and beveled. Install drain grate at downsput outfall to prevent clogging with GI surface material or migrated sediment from stormwater runoff.
- Pipe fittings shall conform to ASTM F-1336.
- Point repair curb when downsput piping is disconnected from the curb line. Cap or fill existing downsput connection behind the curb line when discharging to a curb and gutter underdrain.
- Check valves should be used when connecting downsputs to GI to prevent negative impacts from backflow of stormwater from the ponding area of the GI during storm events.
- Pop-up emitter depths should consider maximum ponding elevation, and the elevation of the upstream downsput. Pop-up should not cause negative impact to discharge of stormwater roof drains.
- Entrance velocities from downsput connections should be considered. Use of energy dissipation may be required. See Design Component 4.1 (Energy Dissipation).

DESIGN SUBMITTAL REQUIREMENTS CHECKLIST:

- Section view of downsput connection specifying pipe invert or depth of pop-up drainage emitter and connection to existing pipe.
- All pipe, fitting material, valves and other appurtenances.
- Inlet designs outside the parameters of this guideline can be submitted for approval to DPU.
Design Components

3.5 — Permeable Concrete

Description: Permeable concrete is a type of permeable pavement that, when cast, has between 15-25% void space within the concrete. These void spaces are interconnected so that water and air are able to pass through from the top surface of the concrete down into aggregate storage layers below. Permeable concrete does not contain fine aggregates and is sometimes referred to as 'no-fines' concrete. Coarse aggregate, Portland cement, water and admixtures are the component materials of permeable concrete.

Where to Use: Permeable concrete may be used in all areas where traditional concrete would be considered for pedestrian use. In addition, permeable concrete may be used in vehicular use areas such as parking lots and roadside parallel parking. It is not recommended for travel lanes on public roadways, but has been successful in low volume residential streets and alleys. Do not use sand or cinders for deicing. Moreover, when this GI practice is used in areas with potential for organic matter to accumulate such as nuts and leaves, monthly maintenance using a vacuum/regenerative air sweeper may be required during growing season.

Specifications:

- Permeable concrete shall comply with current editions of ACI 522.1 and ASTM C94.
- Aggregates for bedding, base and sub-base shall be in accordance with the Permeable Pavement Storage Media – Stone Aggregate specification.
- A model specification and structural design guidance is available from the Ohio Ready Mixed Concrete Association (i.e., “Specifier’s Guide for Permeable Concrete Placement with Detention”). It shall be followed, with the following modifications:
  - Wet cure with UltraCure by McTeh Group or equivalent (Ref: Maloney)
  - Placement of concrete should be done with a hydraulically actuated pipe roller (Ref: Maloney)
  - Joints shall be saw-cut, rolled joints are not to be permitted (Ref: Maloney)
- Specifications shall identify strict adherence to the above-referenced “Specifier’s Guide”, with respect to weather limitations and temperature thresholds for the placement of permeable concrete and for the period of time following placement.

Tests and traditional strength test cannot be used with permeable concrete. Testing shall be for (unit weight), void content and thickness. These tests include ASTM C 172, ASTM C 29, ASTM C 42 ITM C 1858.

Concrete areas shall have concrete edge restraints.
DESIGN SUBMITTAL REQUIREMENTS CHECKLIST:

✓ Plan view of permeable pavement area including section widths and transitions to typical pavement sections, if applicable.
✓ Cross-Section of pavement and subgrade including media depths and relevant surface slopes.
✓ Permeable concrete mix proportions including all material weights, volumes, design density (unit weight), water-cementitious ratio, and design void content.
✓ Aggregate type, source, grading, dry-roddeed unit weight and void content
✓ Cement, supplementary cementitious materials, synthetic or cellulose fibers and chemical admixtures
✓ Requirement for presentation of Contractor’s Qualifications/Credentials including subcontractors
✓ Requirement for Test pour per Ohio Ready Mix Concrete Association guidelines
✓ Construction procedures, and quality control plan

DETAILS:

Green infrastructure design detail can be found on the following page.

PLEASE SEE APPENDIX A FOR REFERENCES AND ADDITIONAL INFORMATION
SECTION 4

FUTURE OF BLUEPRINT AND GI GUIDELINES
New Sections in the *Guidelines*

- Section 3: Construction Approach
- Section 4: Operations and Maintenance
- Section 5: Exceptions to Existing Criteria
- Section 6: Standard Unit Costs
- Section 7: Typical Details

*Anticipated update schedule: 4th Quarter 2014*
Blueprint Columbus GI Implementation & Design Guidelines
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Questions?

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