

Philadelphia Water Department

Stormwater Regulations Update

BIA & Fox Rothschild LLP

May 13, 2015

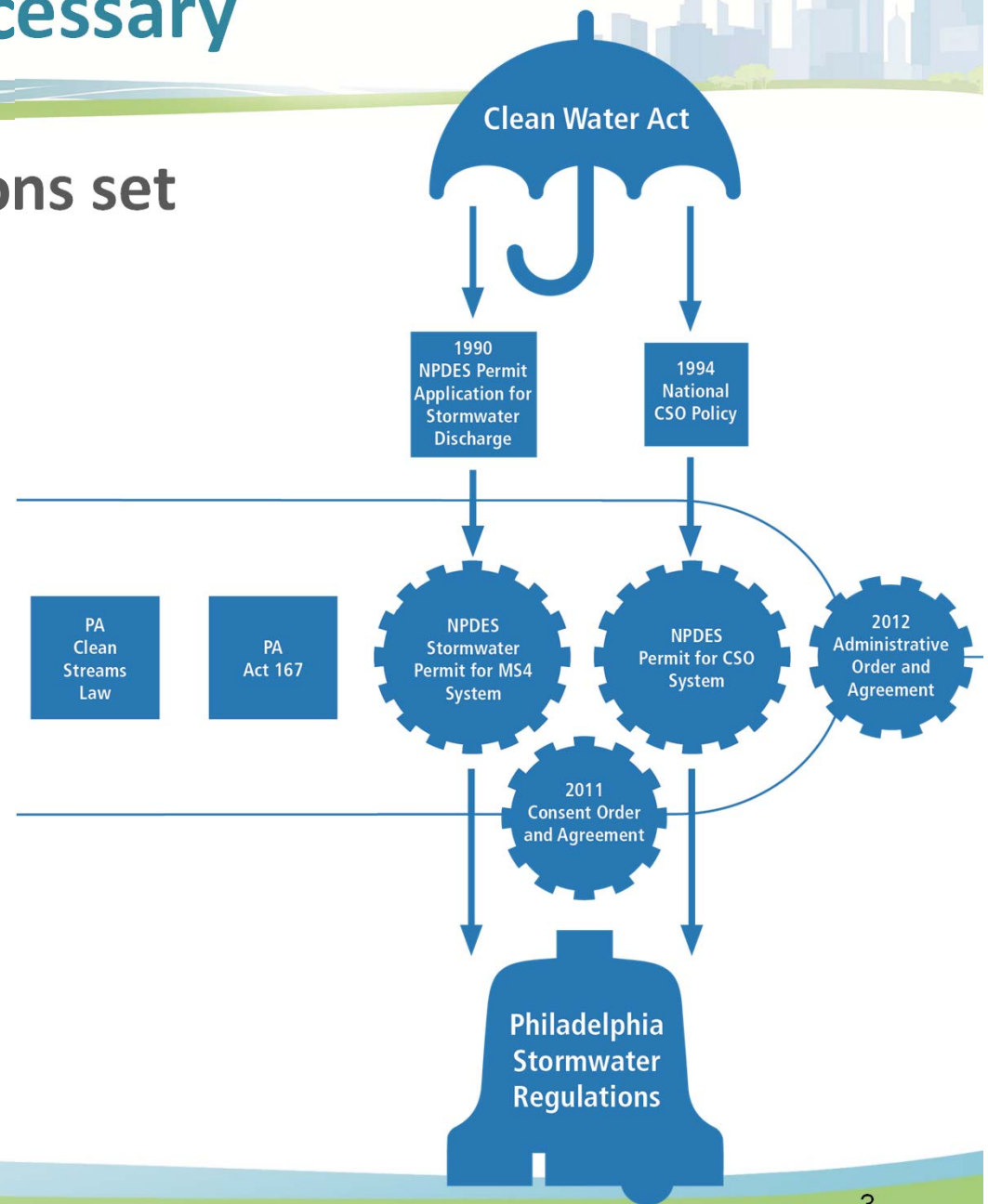


Overview

- Upcoming Regulatory Changes
- Procedural Improvement
- Stormwater Management Guidance Manual v3.0
- New PWDPlanReview.org Website
- How This Applies to Your Project
- What's Next

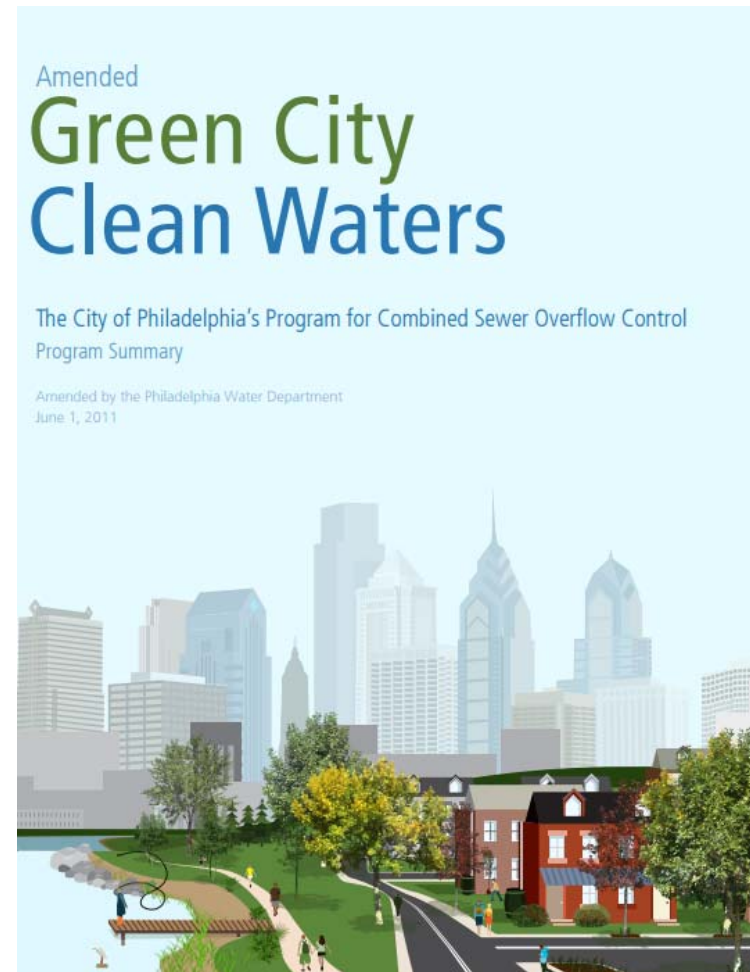
Why Changes are Necessary

- 2006: Current Regulations set
- Multiple Act 167 Plans Approved
 - Darby-Cobbs (2005)
 - Tacony-Frankford (2008)
 - Pennypack (2013)
 - Poquessing (2013)
 - Wissahickon (2015*)



Consent Order & Agreement

- Signed in June 2011
- Formalization of the *Green City, Clean Waters* plan
- Reduce overflows
- Balance infrastructure capacity
- Improve water quality
- Reduce flooding



Upcoming Regulatory Changes

- Earth Disturbance Threshold
DELAYED
 - 15,000 ft² to 5,000 ft²
- More Water
 - 1.5” Water Quality Volume
- Slower Water
 - 0.05cfs per acre-DCIA Release Rate
- Cleaner Water
 - 100% Pollutant Reducing

Project Applicability Stats

Since 2006, on average:

- 75 approvals/year
- 57% combined sewer
- 43% separate sewer or direct discharge
- 68% projects infiltrate citywide
- 23% non-infiltrating combined sewer



Detention



Infiltration



Detention



Infiltration

1.5” Water Quality Volume

- Applies to all development projects
- No adjustments to compliance approach
- Minimal cost increase
- **New Compliance Tools**
 - Bioretention soil credit
 - Decreased minimum allowable infiltration rates



Detention



Infiltration



Detention



Infiltration

0.05 cfs/ac DCIA Release Rate

- Only applies to non-infiltrating combined sewer
- Calibrate with treatment plants
- **New Compliance Tools**
 - Lowered minimum orifice sizes
 - Proprietary rate control products



Detention



Infiltration



Detention



Infiltration

100% Pollutant Reducing

- Infiltrating and separate sewer projects already achieve this
- Existing green SMPs are still preferred
- **New Compliance Tools**
 - Increased loading ratios
 - Vegetated Media Filters & Media Filters
 - Roof Runoff Isolation



Detention



Infiltration



Detention



Infiltration

Roof Runoff Isolation

- Clean rooftops are pollutant-reducing SMPs
- 0.05 cfs/ac release rate still applies

Qualifying Criteria

- Non-vehicular area
- Not mixed with untreated runoff
- **Combined Sewer System only**



Non-infiltrating Pollutant Reducing Practices

	Combined Sewer	Separate Sewer/ Direct Discharge
Bioretention	Yes	Yes
Porous Pavement DIC	Yes	Yes
Green Roofs	Yes	Yes
Cisterns	Yes	Yes
Blue Roofs	Yes	No
Ponds and Wet Basins	Yes	Yes
Vegetated Media Filters	Yes	Yes
Media Filters	Yes	Yes
Roof Runoff Isolation	Yes	No

July 2015 Technical Requirements



	Current	July 2015
Water Quality Volume	1.0"	1.5"
Water Quality Rate	0.24 cfs/acre	0.05 cfs/acre
WQ Treatment: MS4	100% Volume Reducing	100% Pollutant Reducing
WQ Treatment: Combined	20% Volume Reducing	100% Pollutant Reducing
Minimum Orifice Diameter	3 inches	1 inch (Traditional)
		½ inch (Underdrain)
Surface Loading Ratio	10:1	16:1
Subsurface Loading Ratio	5:1	8:1
Bioretention Soil Volume Credit	None	20% Void Space
Minimum Infiltration Rate	0.5 in/hr	0.4 in/hr
Disconnection Practices	----- No Changes -----	

Significant Procedural Improvements



- SMP Hierarchy
- Expedited Reviews
- Application Resources
- Revised Guidance Manual
- Updated PWDPlanReview.org Website

SMP Hierarchy



- Ranks SMPs
- Weighted Ranking
 - Performance
 - Cost
 - Maintenance
 - Triple Bottom Line
- Manual structured to match hierarchy
- Incentivizes top SMPs
 - Water Quality Bio Sizing Table
 - Standard Details
 - Expedited Review

SMP	Rank
Bioinfiltration	1
Bioretention	2
Porous Pavement	3
Green Roofs	4
Subsurface Infiltration	5
Cisterns	6
Blue Roofs	7
Ponds & Wet Basins	8
Subsurface Detention with Vegetated Media Filter	9
Subsurface Detention with Roof Runoff Isolation	10
Subsurface Detention with Media Filter	11
Vegetated Media Filter	12
Media Filter	13

Expedited Reviews



- **Standard Project Review**
 - 15 Day Review Time
 - All Development Types and All SMPs
- **Disconnection Green Review**
 - 5 Day Review Time
 - Only Redevelopment Projects with Disconnection Practices
- **New Surface Green Review**
 - 5 Day Review Time
 - All Development Types
 - Only Bio Basins and Disconnection Practices

Application Resources



- Process Flow Charts
- Submission Package Checklists
- Clarified Design Requirements
- Streamlined Technical Design Workbook
- How to Show Compliance Steps

Guidance Manual Version 3.0

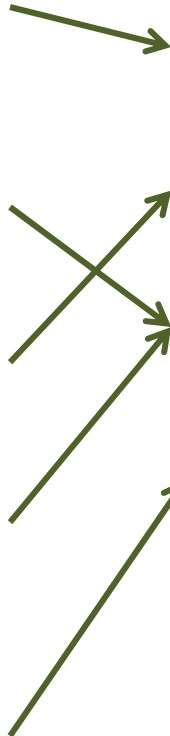


SWMGM Version 2.1

- Chapter 1: Introduction
- Chapter 2: Applicability
- Chapter 3: Site Planning
- Chapter 4: Integrated Site Design
- Chapter 5: Post-Construction Stormwater Management Plans
- Chapter 6: Utilizing Existing Site Features
- Chapter 7: SMP Design Guidelines
- Chapter 8: Landscape Guidance

SWMGM Version 3.0

- Introduction** **NEW**
- Chapter 1: Regulatory Requirements
- Chapter 2: Submission, Review, and Approval Procedures
- Chapter 3: Site Design and Stormwater Management Integration
- Chapter 4: SMP Guidance
- Chapter 5: Construction Guidance
- Chapter 6: Post-Construction and Operations & Maintenance Guidance
- NEW**



Guidance Manual Version 3.0



Manual Introduction

Purpose:

- Executive Summary
- Manual organization and purpose

Highlight:

- Stormwater Plan Review Program & Contact Info
- Regulatory Background
- Concise Summary

Chapter 1: Regulatory Requirements

Purpose:

- Understanding Project Applicability
- Detailed Discussion of Stormwater Regulations

Highlight:

- Three Factors to Determine Applicability
- Flow Charts conveying requirements and exemptions

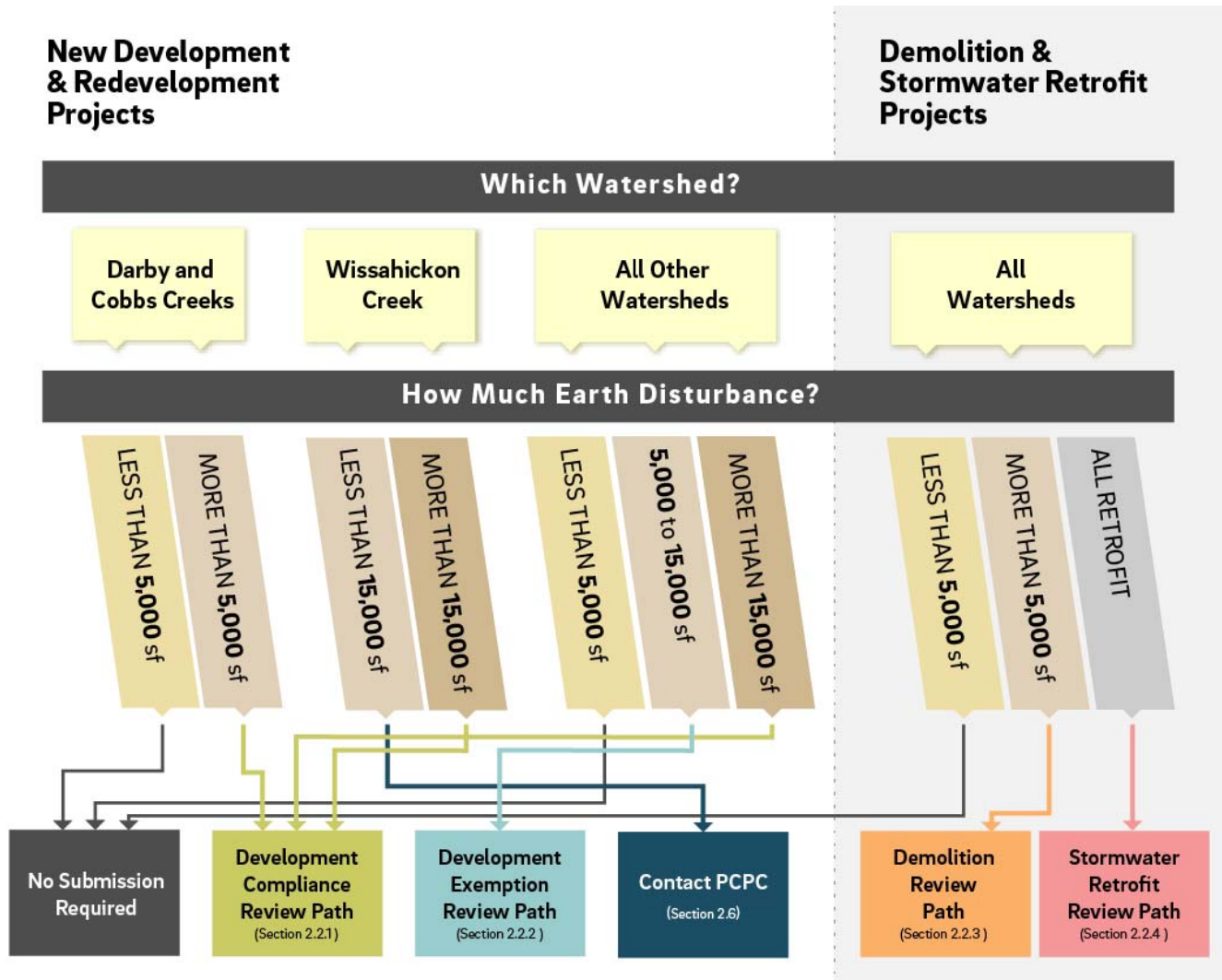
Guidance Manual Version 3.0



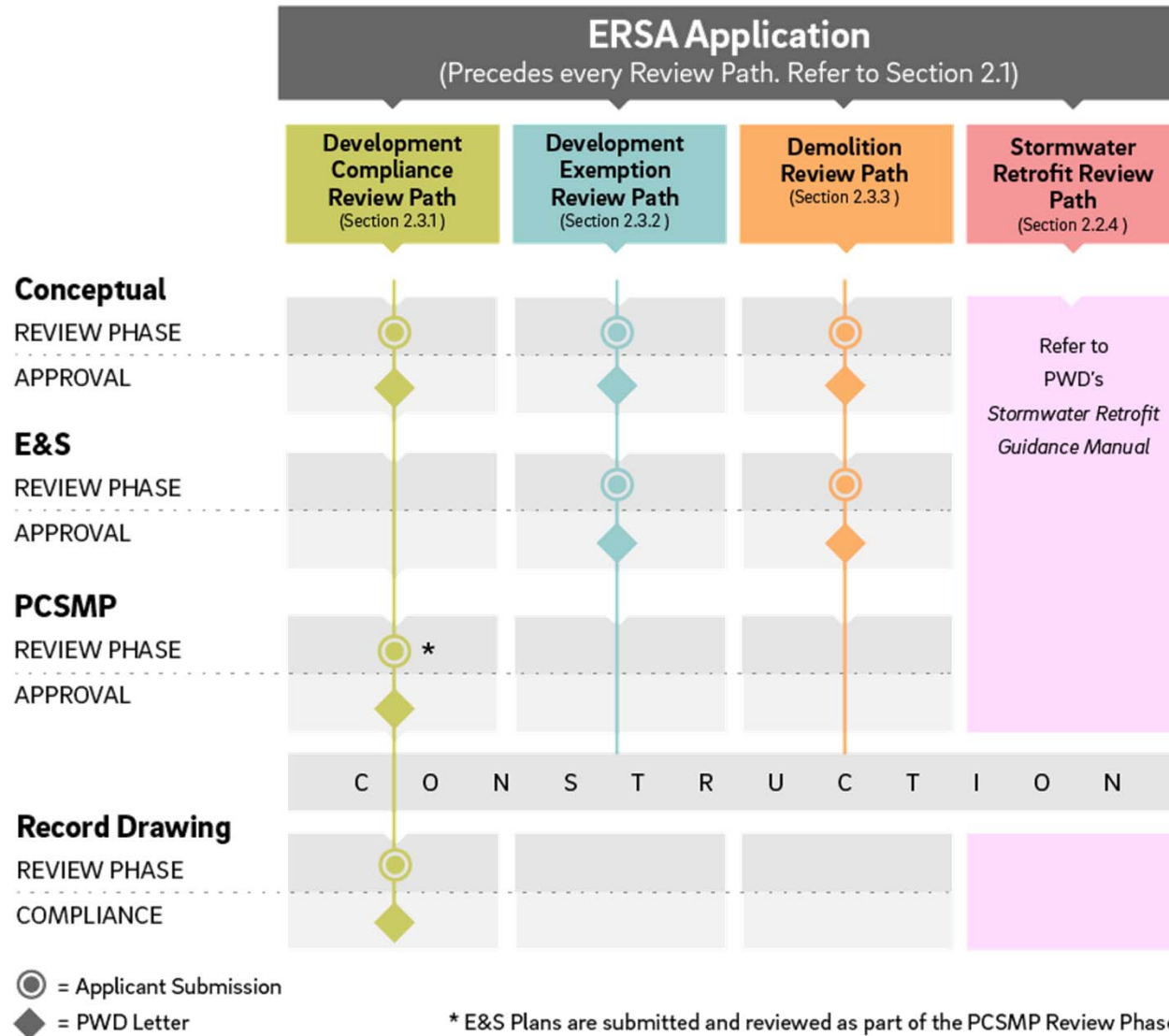
Chapter 2: Submission, Review and Approval

- **Purpose**
 - Comprehensive Review Process Information
 - Clarity of Review Paths and Phases
- **Highlights**
 - PWD Unit Reviews, City and State Agency Coordination
 - Expedited PCSMP Review Submissions
 - Process Flow Charts
 - Review Paths and Phases

Project Review Path Determination



Summary of Review Phases for Each Review Path



Guidance Manual Version 3.0



Chapter 3: Site Design and SWM Integration

Purpose:

- Integrating Stormwater Management into a Development Site

Highlights:

- Preferred Design Approach with SMP Hierarchy
- Pollutant-Reducing Practices
- Comprehensive Infiltration Testing Guidance

Chapter 4: SMP Guidance

Purpose:

- Detailed SMP guidance and design requirements in Standardized Format

Highlights:

- Clarified design requirements
- SMP One-Sheets
- Standard Details & Renderings

SMP One-Sheets



Bioinfiltration /Bioretention

Description

Bioinfiltration and bioretention SMPs, often referred to as rain gardens, are vegetated depressions or basins that use surface storage, vegetation, planting soil, outlet controls, and other components to treat, detain, and retain stormwater runoff. Bioinfiltration and bioretention SMPs represent the highest level of preference in PWD's SMP Hierarchy by providing high-performance and cost-effective stormwater management, green space, and triple bottom line benefits.

Both types of SMPs reduce pollution in and volume of stormwater by filtering runoff through a vegetated soil medium that promotes evapotranspiration. Bioinfiltration SMPs remove stormwater via infiltration into the surrounding soils while bioretention SMPs attenuate runoff with flow-regulating underdrains. Bioinfiltration/bioretention SMPs can be found in a variety of configurations from relatively large and open vegetated basins to small scale SMPs contained within flow-through planter boxes.

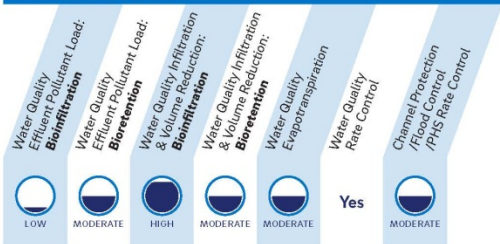
Key Advantages

- Flexible layout and easy to incorporate in landscaped areas
- Very effective at removing pollutants and reducing runoff volumes
- Generally one of the more cost-effective stormwater management options
- Relatively low cost maintenance activities
- Can contribute to better air quality and help reduce urban heat island impacts
- Can improve property values and site aesthetics through attractive landscaping
- Eligible for inclusion in an Expedited PCSMP Review project

Key Limitations

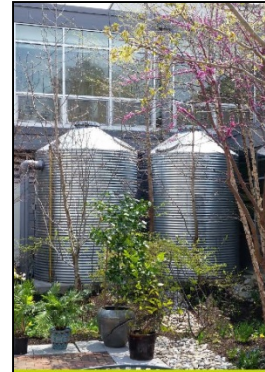
- May need to be combined with other SMPs to meet the Flood Control requirement
- May have limited opportunities for implementation due to the amount of open space available at the site

COMPLIANCE ATTRIBUTES



A description of each evaluated attribute can be found in the SMP Hierarchy Ranking Criteria in Section 3.2.4.

DEVELOPMENT ATTRIBUTES



Cisterns

Description

Cisterns are storage tanks, located either above or below ground, that hold rainwater for beneficial reuse. Cisterns are multi-function systems that help to meet the Stormwater Regulations and collect water for reuse. Rainwater may be collected from rooftops or other impervious surfaces and conveyed to cisterns for storage. Stored water may drain by gravity or be pumped to its ultimate end use.

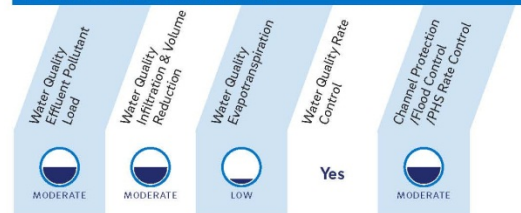
Key Advantages

- Can be used to provide rate control within small/constrained spaces
- Decrease demand on the municipal water supply and water costs for the end user, when used as part of a rainwater harvesting system in accordance with City, State, and Federal code restrictions
- Can be sited, through flexible design options, beneath lawns, recreational areas, parking lots, other impervious areas, or within buildings when space constraints exist
- Provide educational benefits, especially at public and/or highly visible sites

Key Limitations

- May not be able to fully meet the Water Quality requirement
- Limited to circumstances where there is a year-round water demand that can replenish storage capacity between storms
- May be subject to additional City, State, and Federal code restrictions
- Require draining before a freeze when located on the surface, to prevent structural damage
- Require strict adherence to regularly-scheduled inspections because the maintenance needs are not easily visible
- Does not improve aesthetics or provide the ancillary environmental benefits associated with vegetated SMPs, such as habitat creation and improved air quality

COMPLIANCE ATTRIBUTES

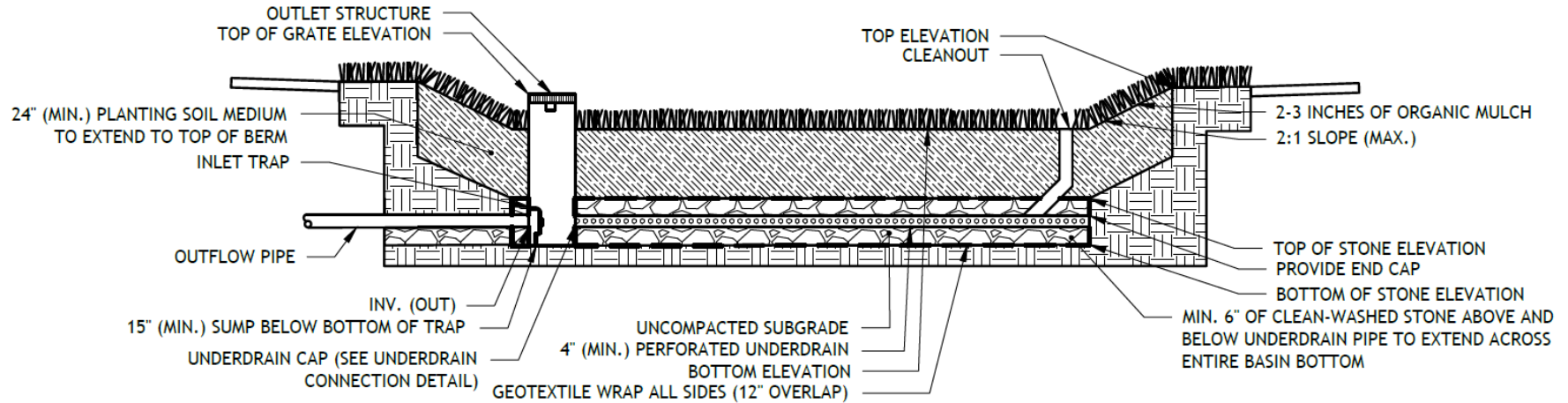


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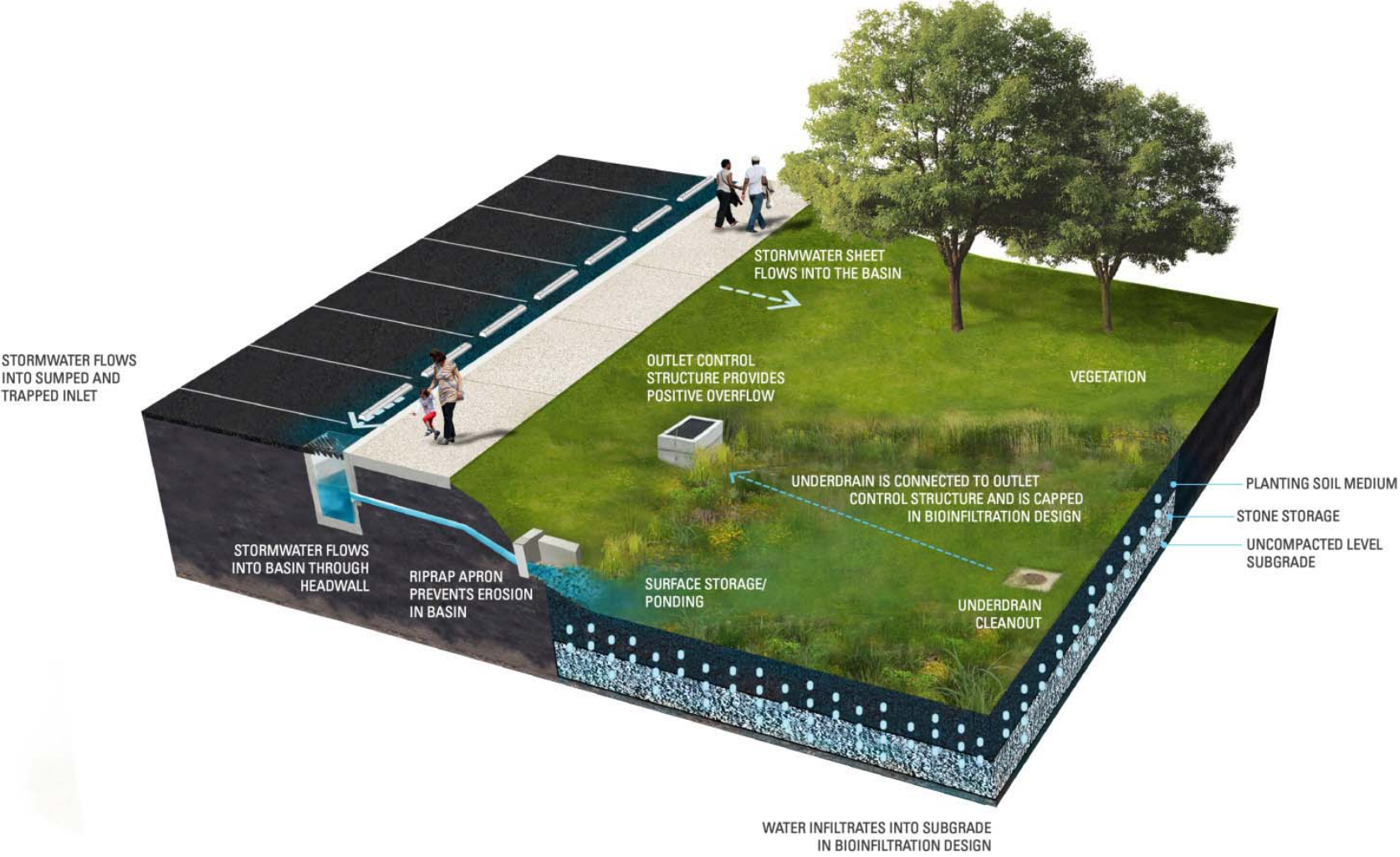
DEVELOPMENT ATTRIBUTES



Bioinfiltration/Bioretention Basin Standard Detail



Bioinfiltration/Bioretention Basin with Typical Features



Guidance Manual Version 3.0



Chapter 5: Construction Guidance

Purpose:

- Discussion of post-approval activities

Highlights:

- Discussion of required documentation
- New content to outline the process

Chapter 6: Post-Construction and O&M

Purpose:

- Discussion of Post-Construction Activities

Highlights:

- Routine Maintenance for Property Owners
- Stormwater Credit Opportunities

Guidance Manual Version 3.0



Appendix

- Plan, Report, and Submission Package Checklists
- Updated Design Guidance Checklist
- Updated Design Compliance Worksheets
- Infiltration Testing Log
- Record Drawing Sample

Procedural Improvements Feedback



- **“Provide more access to reviewers”**
 - Pre-application meetings are always an option
 - **NEW:** Notification emails when review begins
 - **NEW:** Encourage meetings for more complicated projects
- **“Reviews vary based on reviewer experience and interpretation”**
 - Internal meetings ensure consistency among reviewers
 - Complex projects are assigned to staff with adequate experience
 - **NEW:** Design Guidance Checklist in Manual Appendix
- **“Projects with pending ownership changes have O&M issues”**
 - Conditional Approvals for projects with pending ownership transactions

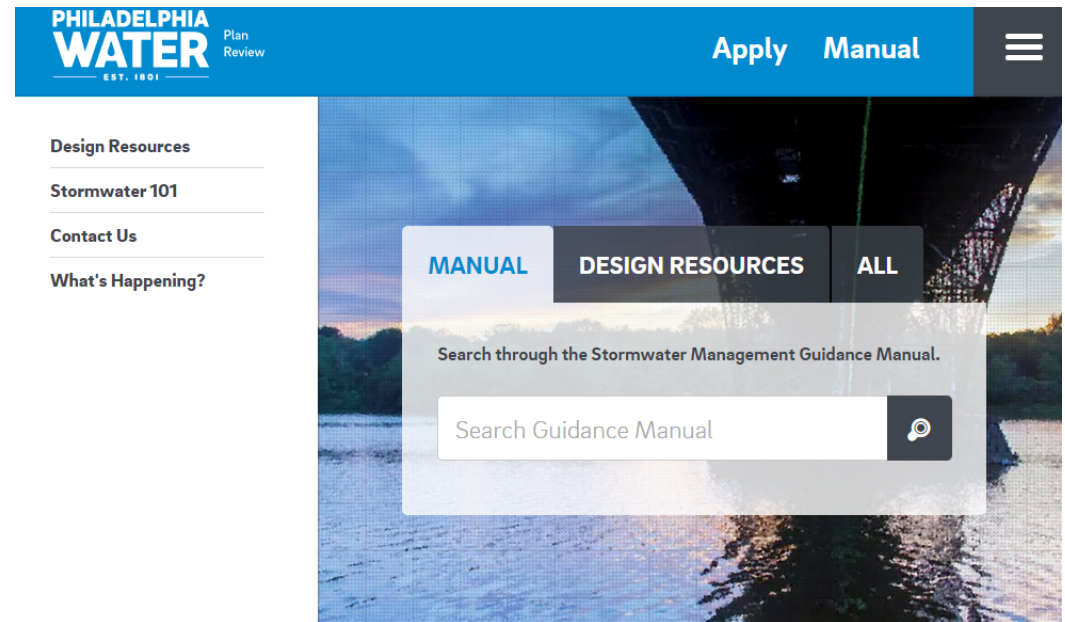
Procedural Improvements Feedback



- **“A status update option would be helpful”**
 - **NEW:** Website log-on, with links to projects and meeting request form
- **“Improve coordination within PWD”**
 - **NEW:** Dedicated Manual section about other PWD reviews
- **“Reach out to the development community more frequently”**
 - **NEW:** Yearly seminars and update presentations
- **“PWD should reward exceptional projects”**
 - Stormwater Pioneers program implemented

PWDPlanReview.org Website

- Complete redesign
- Web-Based Manual
- Streamlined ERSA Application
- Improved project tracking
- Fully searchable
- Mobile friendly



How This Applies to Your Project



- **Effective for new projects submitting July 1, 2015**
- **All active projects will be grandfathered**
 - **Complete ERSA submission before July 1, 2015**

What's Next



- **Target for Manual release June 1st**
- **Five Information Sessions at MSB**
 - 6/19, 6/23, 6/30, 7/9, 7/16
- **Regulations Effective July 1, 2015**
- **New PWDPlanReview.org launch July 1, 2015**

www.PhillyWatersheds.org/StormwaterRegulations

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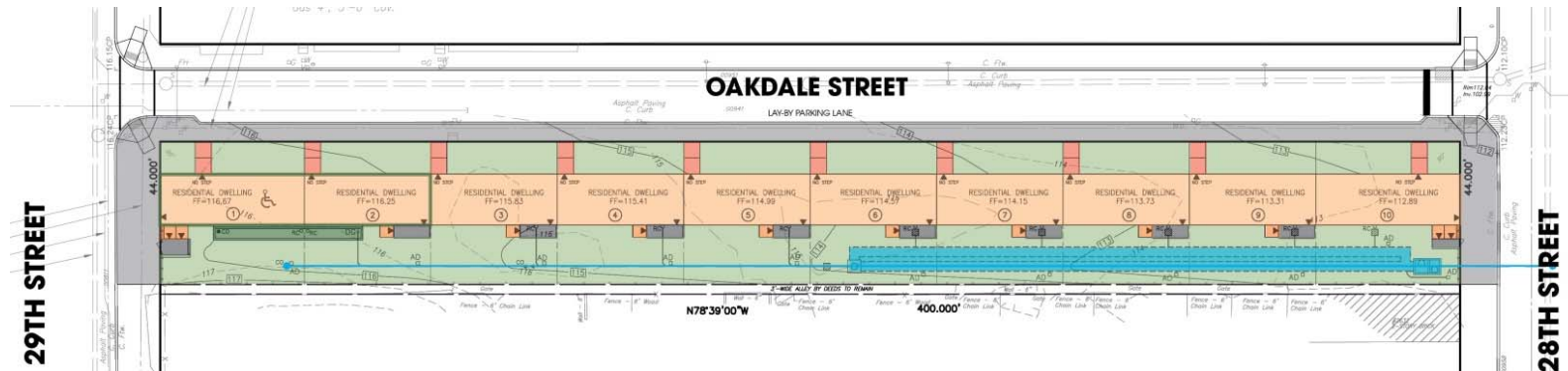
Project Case Studies

**Presented By:
Stantec**

**Rodriguez Consulting
Ruggiero Plante Land Design**



Oakdale Street Development



Project Team



Owner: Philadelphia Housing Authority



Contractor: Dale Corporation



Architect: JKR Partners

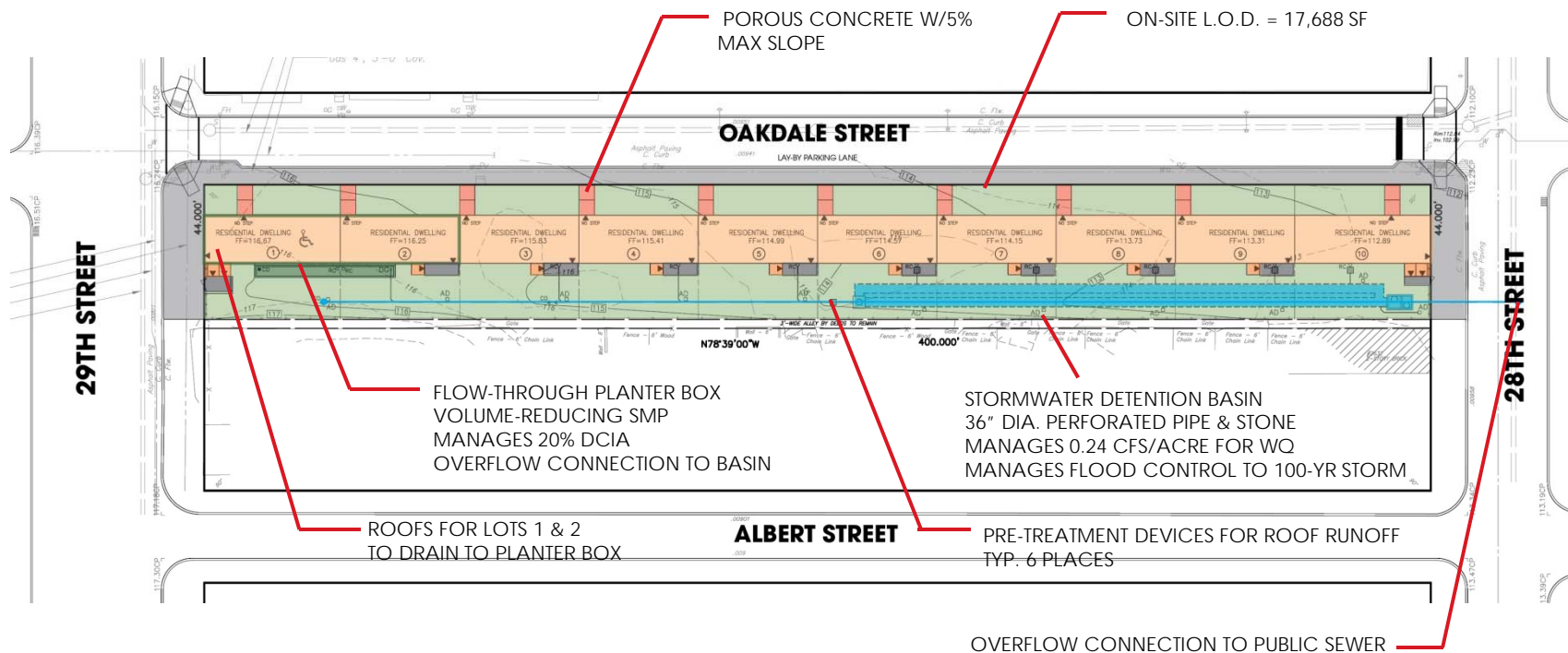


Oakdale Street Development

Project Summary:

- Small Site (17,688 SF)
- Fee Simple Single Family Residential Development
- Existing Site Predominantly Vegetated
- Infiltration Not Feasible
 - Isolation Distances Not Achievable
 - Proximity to Existing Buildings w/Basements
- Impervious Area almost entirely attributable to proposed buildings
- Applicable Requirements
 - Water Quality
 - Flood Control
 - 20% Volume-Reducing SMP

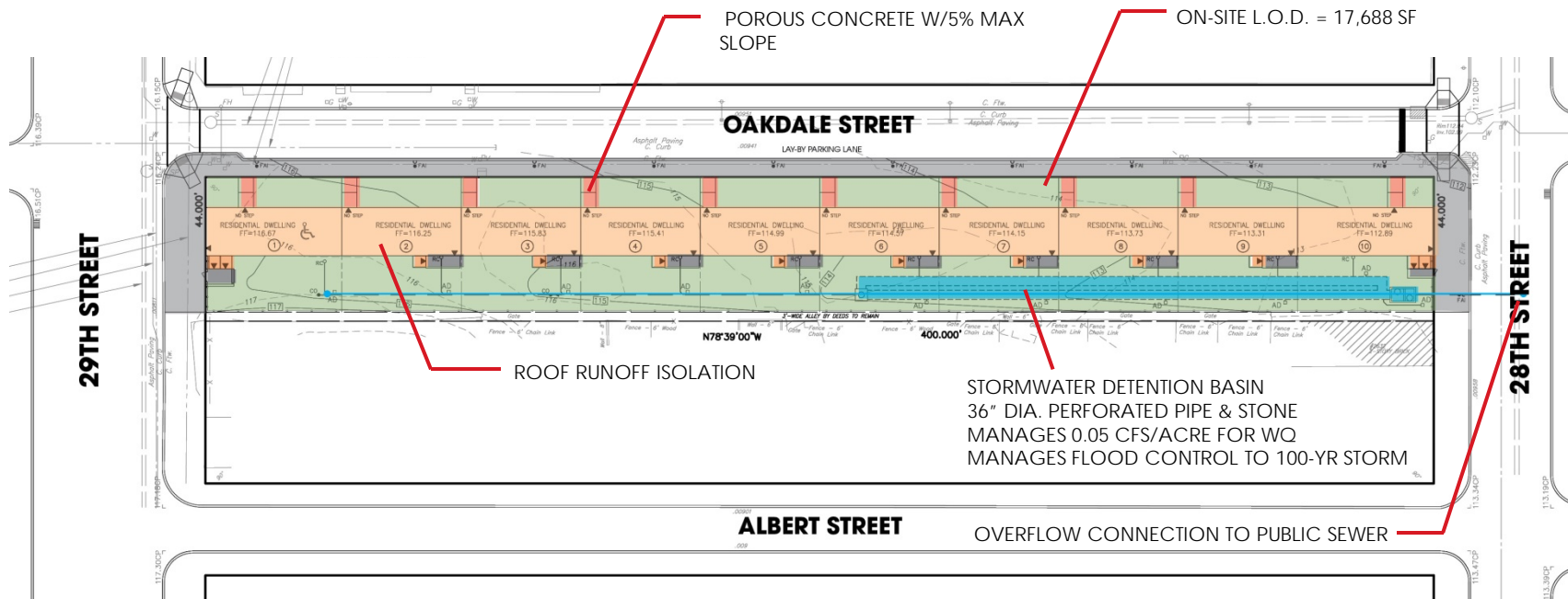
2014 Approved Plan



SMP's

1. Detention Basin
2. Porous Paving at Front Sidewalks
3. Flow-Through Planter Box
 - Volume Reducing SMP for 20% DCIA
 - Manages Roof Runoff from 2 Buildings
 - Overflow to Detention Basin

July 2015 Plan



SMP's

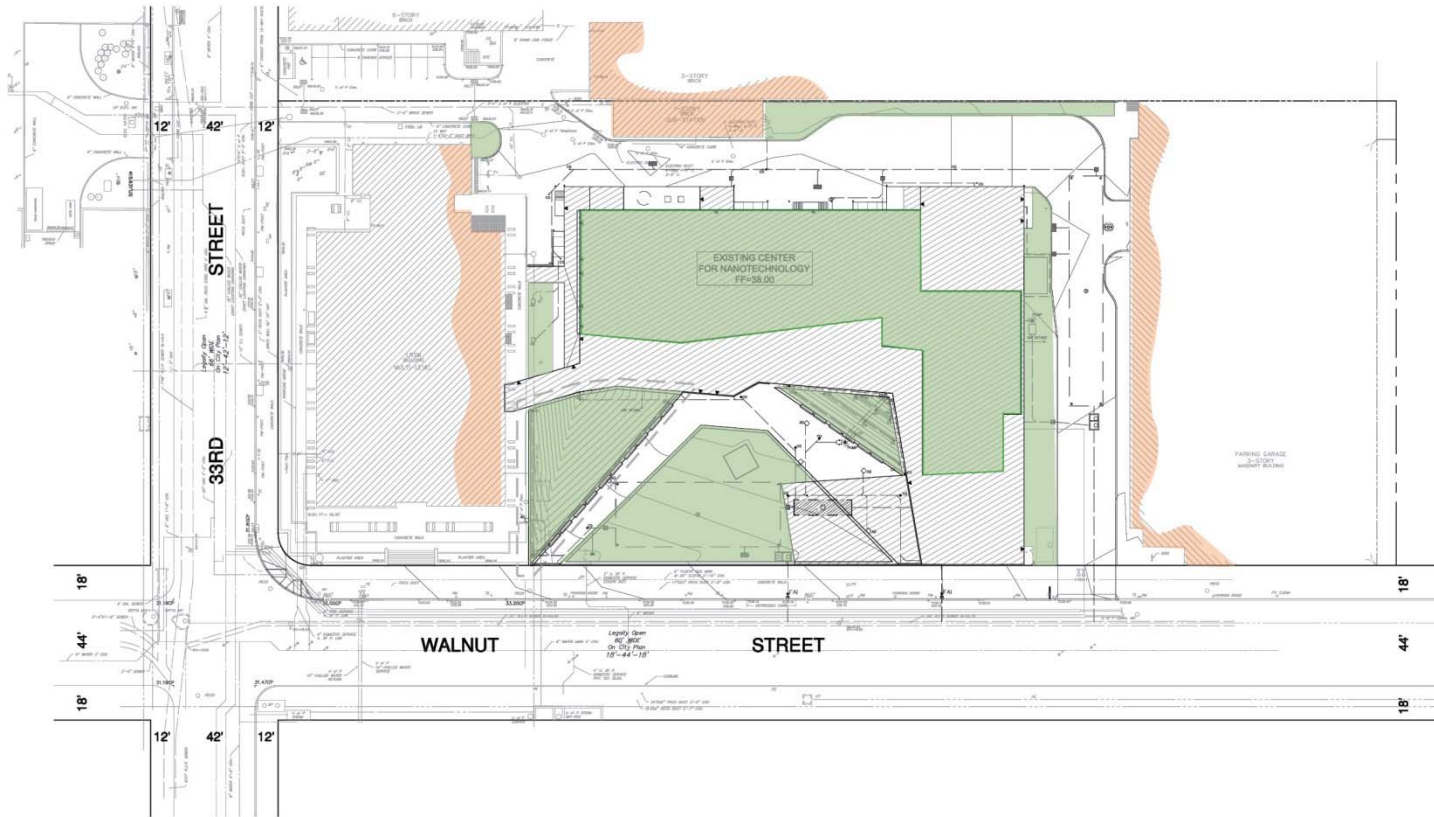
1. Detention Basin
2. Porous Paving at Front Sidewalks

Conclusions

Changes to Design for Compliance

- Flow-Through Planter Box Removed
 - No Requirement for Volume-Reducing SMP
- Roof Runoff Isolation to Meet Pollutant-Reduction Requirement
- Pre-Treatment Not Required
 - 6 Pre-Treatment Devices Removed
- Detention Basin
 - Outlet Structure Modified to Meet Lower Release Rate
 - No Change to Footprint or Size of Basin
- Reduction in Construction Costs
 - Removal of Flow-Through Planter Box & Pre-Treatment Devices
 - Savings on order of magnitude of \$40,000

Center for Nanotechnology



Owner: University of Pennsylvania

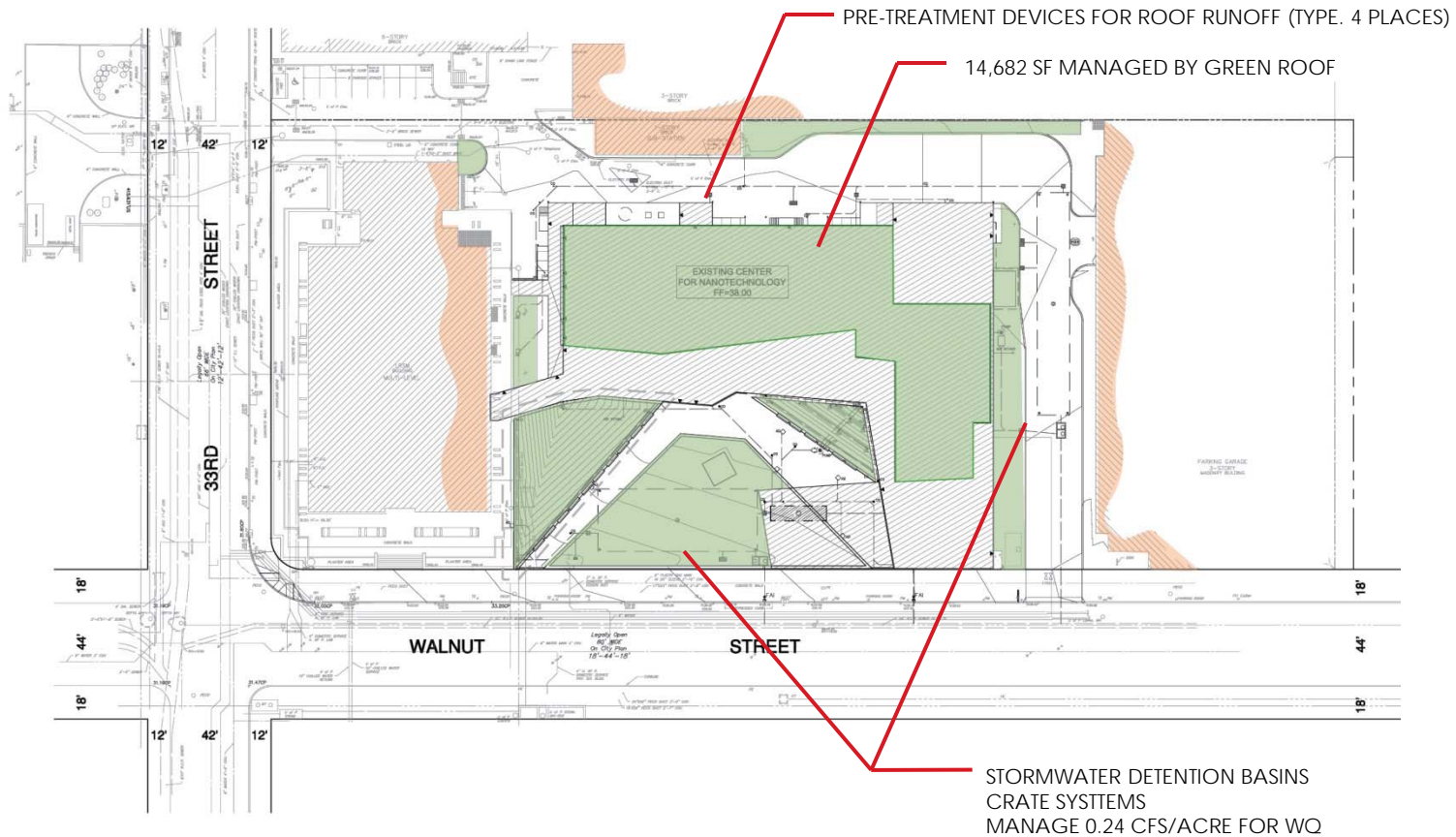


Center for Nanotechnology

Project Summary:

- Large Site (79,147 SF Stormwater Study Area)
- Multi-story Research Facility
- Existing Site Predominantly Paved
- Infiltration Not Feasible
 - Old Foundations and Walls within Basin Areas
 - No Measurable Infiltration
- Impervious Area attributable to proposed building, walkways, and driveway area
- Applicable Requirements
 - Water Quality Only

2011 Approved Plan



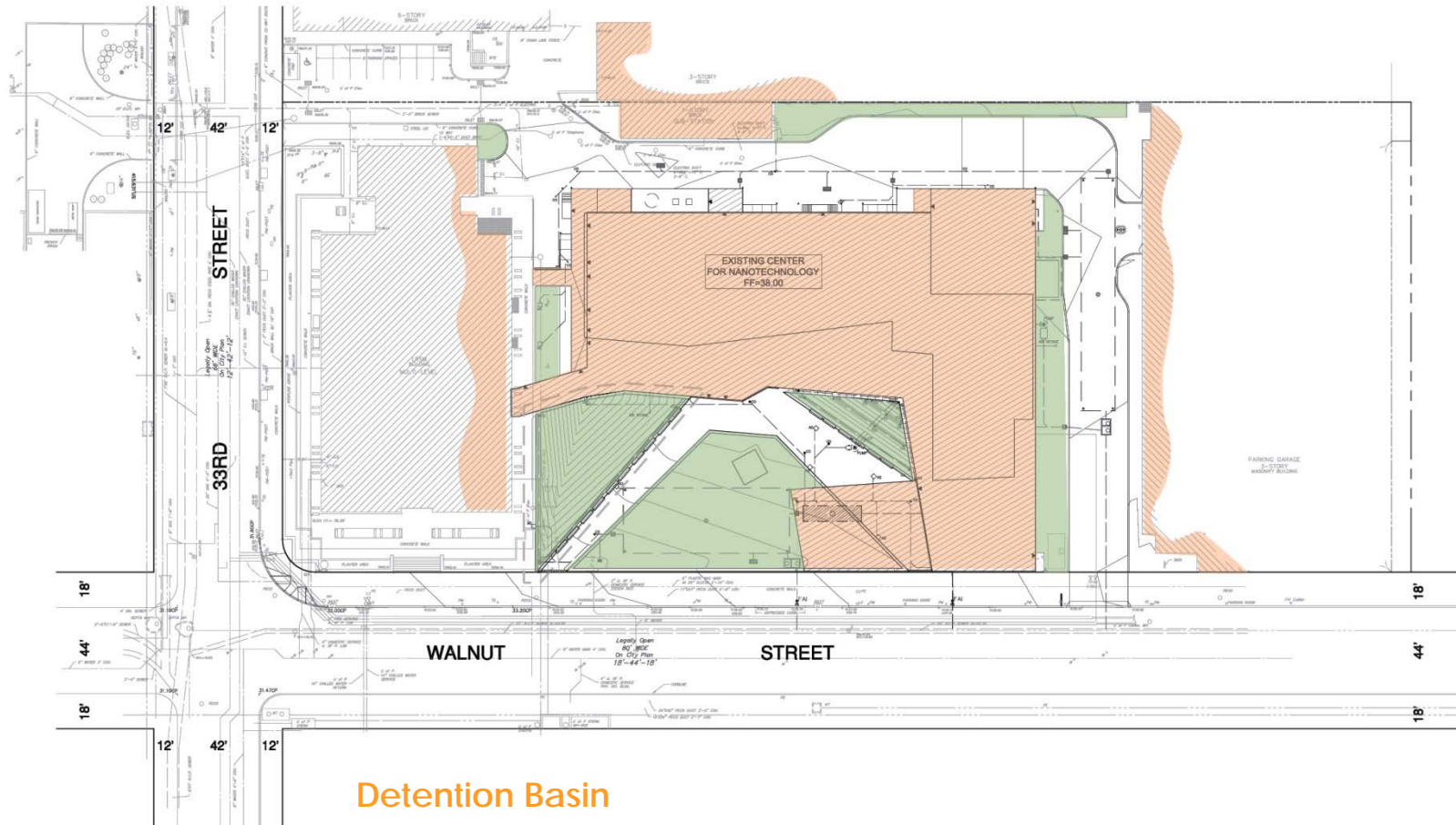
Detention Basin

- Water Quality
- Pre-Treatment for all roof runoff

Green Roofs

- Volume Reducing SMP for 20% DCIA
- Overflow to Detention Basin

July 2015 Plan



Detention Basin

- Water Quality = 0.05 cfs/acre DCIA
- Jellyfish Filter JF4-2-1 or Jf6-3-1 to be installed downstream of basins

Conclusions

Changes to Design for Compliance:

- Green Roof removed
 - No Requirement for Volume-Reducing SMP
 - Additional 206 SF of Pervious Area added to reach 20% Reduction in Impervious Area due to Removal of Greenroof
- Pre-Treatment Not Required for Roof Runoff
 - 4 Pre-Treatment Devices Removed
- Detention Basins
 - Outlet Structures Modified to Meet Lower Release Rate
 - No Change to Footprint or Size of Basin
- Sand Filter was sized to meet the Pollutant Reducing Requirement but required design was too large for site.
- Proprietary Contech Jellyfish Filter to be used instead.

Conclusions

- Stormwater Management Practices Remained
- Size and Depth of Stormwater Management Practices Remained the same
- Outlet Structures Changed as Needed
- If we could redesign the site, we would omit the Green Roof and include the downstream stormwater water quality pollutant reducer instead.



PWD Case Study – Tajdeed Residences

Building Industry Association of Philadelphia

May 13, 2015

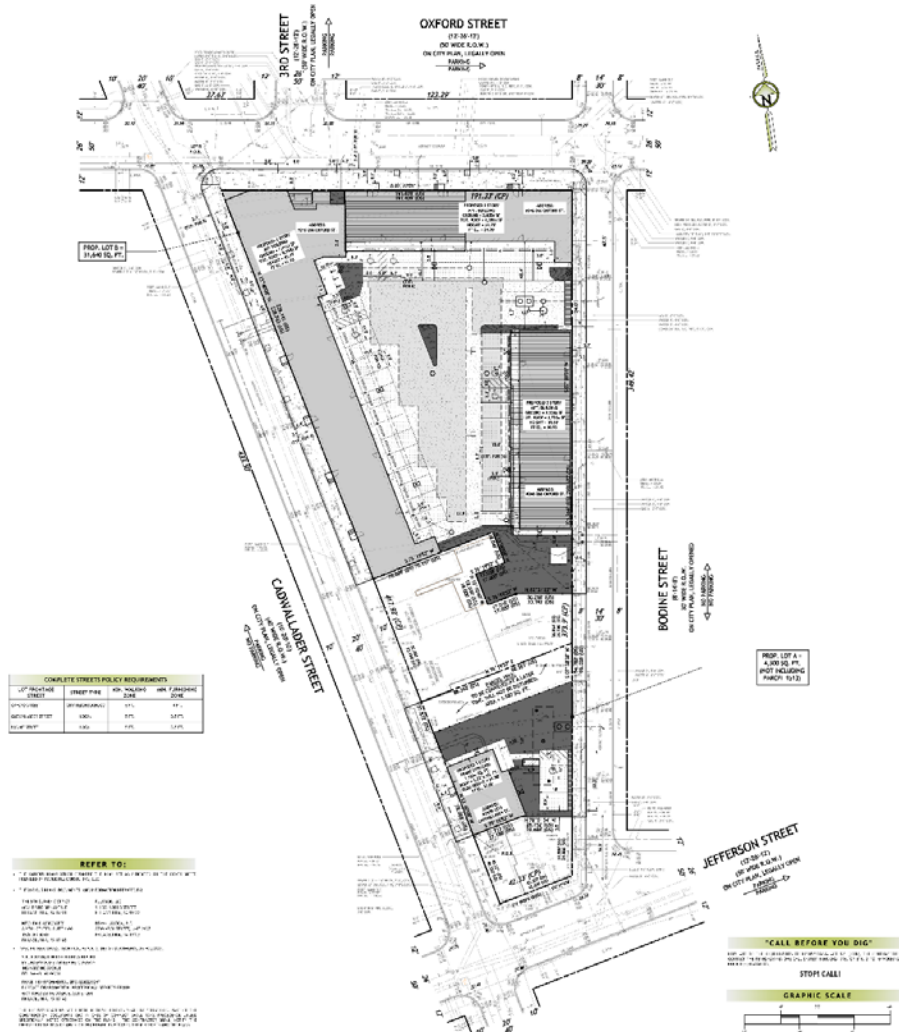
Presented By: Matthew Sherwood



Innovative Designs and Creative Applications of Technology
A Certified Minority-Owned (MBE) & Disadvantaged Business Enterprise

Tajdeed

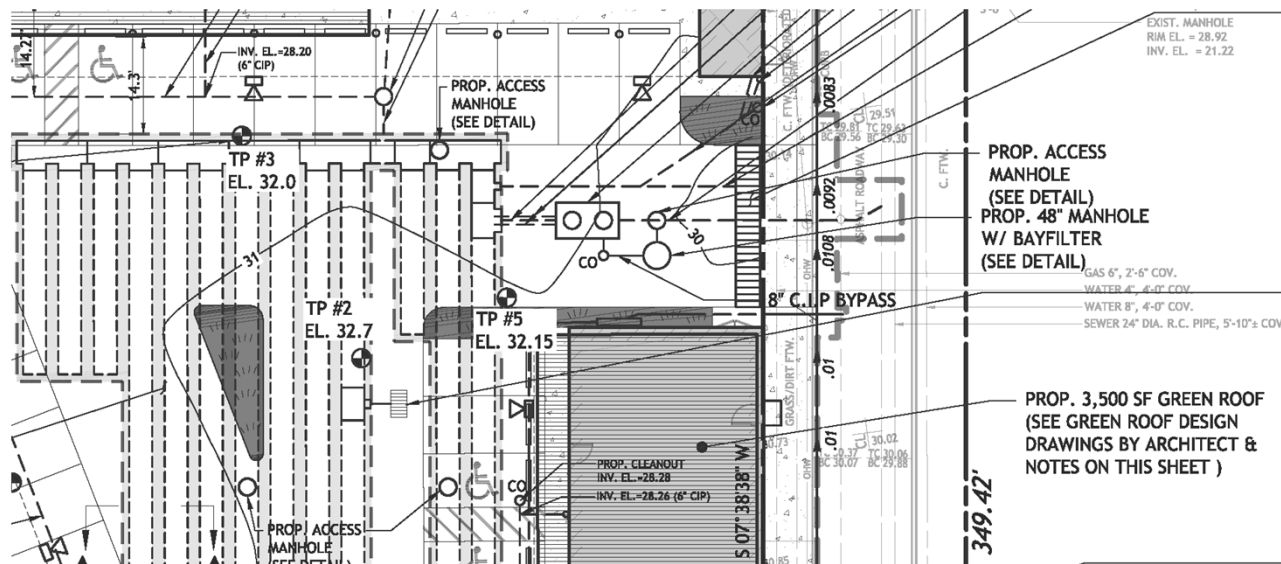
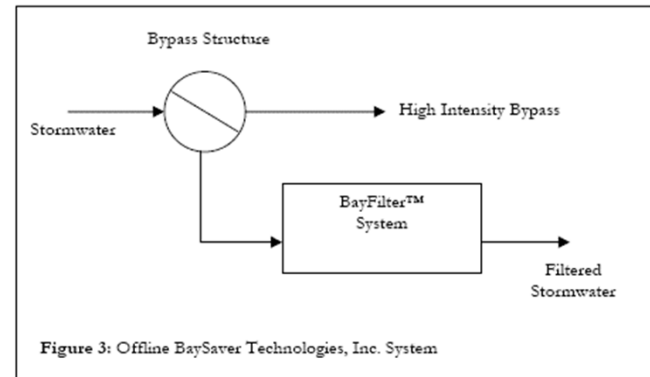
- Multi-family Residential Development over 15,000 sq. ft. disturbed area threshold
- Redevelopment Site
- Divided into Lot 'A' and Lot 'B'
- Soil Type "D": Infiltration Waiver
- Applicable Requirements:
 - Water Quality – 20% Volume reducing through Green Roof & Planter Box
 - Flood Control – 20% reduction not met
 - Public Health & Safety (PHS) – 0.356 cfs/acre



Innovative Designs and Creative Applications of Technology
 A Certified Minority-Owned (MBE) & Disadvantaged Business Enterprise

BayFilter

- Located downstream of control structure with bypass for larger storms.
- 48-inch manhole with 1 filter cartridge
- Initial materials cost \$7,500
- Maintenance cost: Filter to be replaced every 3 years by Bay Saver, Cost: \$800-\$1000



Innovative Designs and Creative Applications of Technology
A Certified Minority-Owned (MBE) & Disadvantaged Business Enterprise



Conclusions

- No significant design challenges due to site being previously designed for low PHS rate.
- To meet the new design requirements SMPs were revised, however, no SMPs were added to the site or removed.
- The resulting changes to the proposed plan:
 - Green Roof and Planter Box kept to meet Flood Control requirements
 - Increased water quality volume and maximum discharge rate of 0.05 cfs/acre met by altering control structure (adjust elevations and added 1-inch orifice)
 - BayFilter Product installed to meet 100% pollutant reducing requirement.
- The BayFilter was chosen for this site from the list of acceptable products because it meets the low flow requirement.





Conclusions

- Design changes result in increased cost of \$7,500 for the initial materials of the BayFilter with a maintenance cost of \$800-\$1000 every 3 years for filter replacement from the manufacturer.
- Qualitatively, there were little to no cost changes to meet the new design regulations for this site.
- If redesigned, the Green Roof would have been reconsidered since the 20% Water Quality volume reduction is no longer required.
- As previously stated, there was not a significant design change for this site. In order to meet the new design regulations we had the benefit from already designing to meet a low PHS rate. This resulted in only needing to revise the outlet control structure and add a filter system to satisfy the new regulations.



Ruggiero Plante Land Design

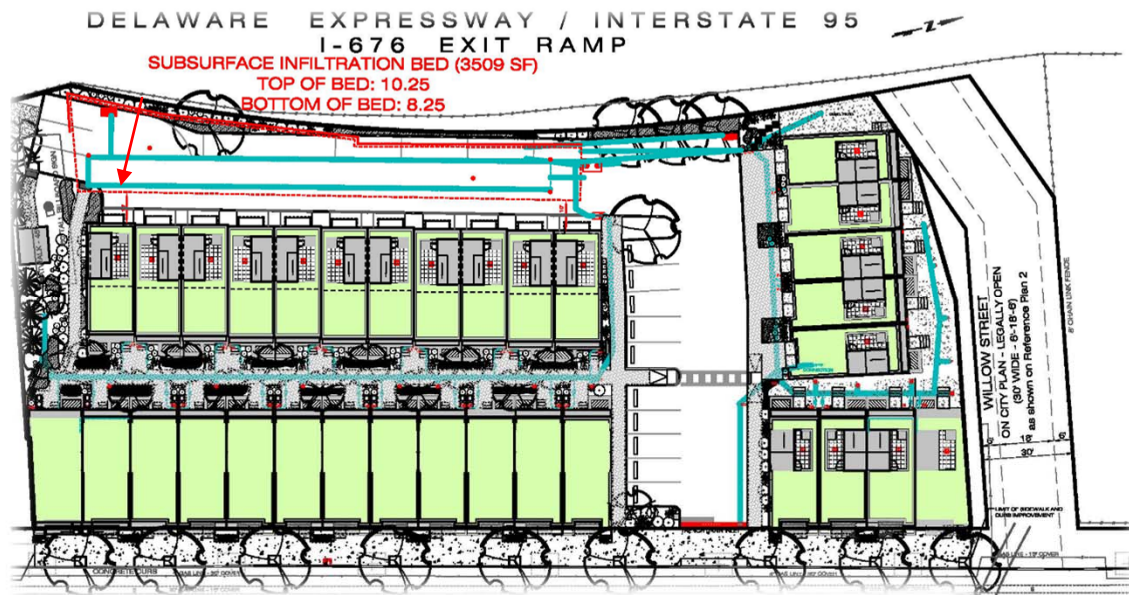
Landscape Architecture . Civil Engineering

Site Planning . Land Surveying

Approved

- Green Roof, Porous Pavement installed (20% reduction)
- WQ requirements: treatment of 1" of runoff from remaining DCIA
- Remaining 16,000 SF DCIA treated by subsurface basin with 5:1 loading ratio
- 5,309 sf basin contact area

Approved

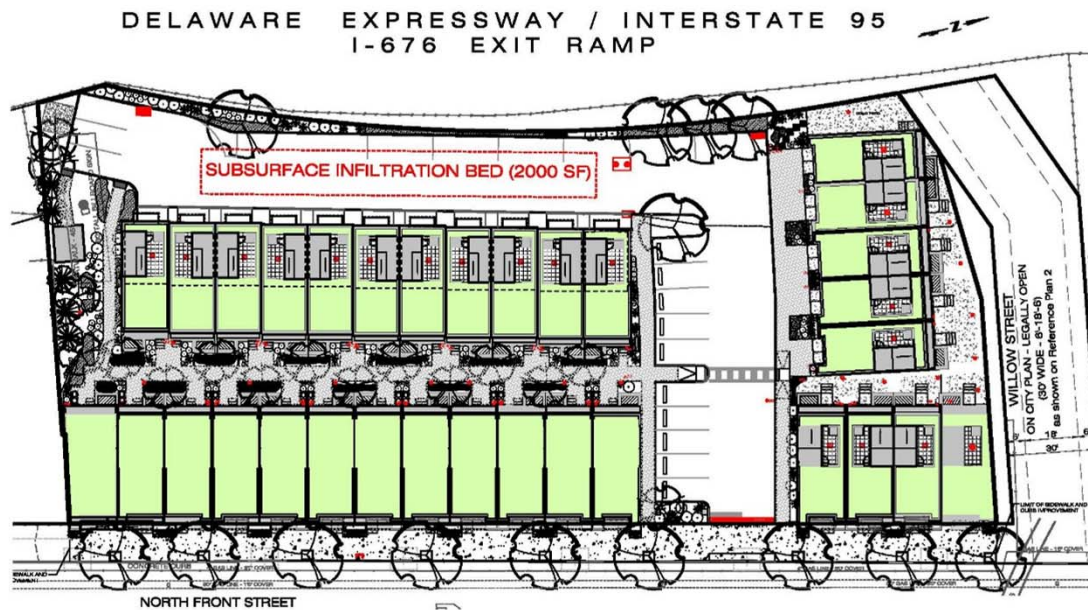


- SMP'S TO MEET WQ REQUIREMENT:

Green Roof, Porous Pavement, Subsurface Infiltration Basin, Tree

Disconnection

Approach #1



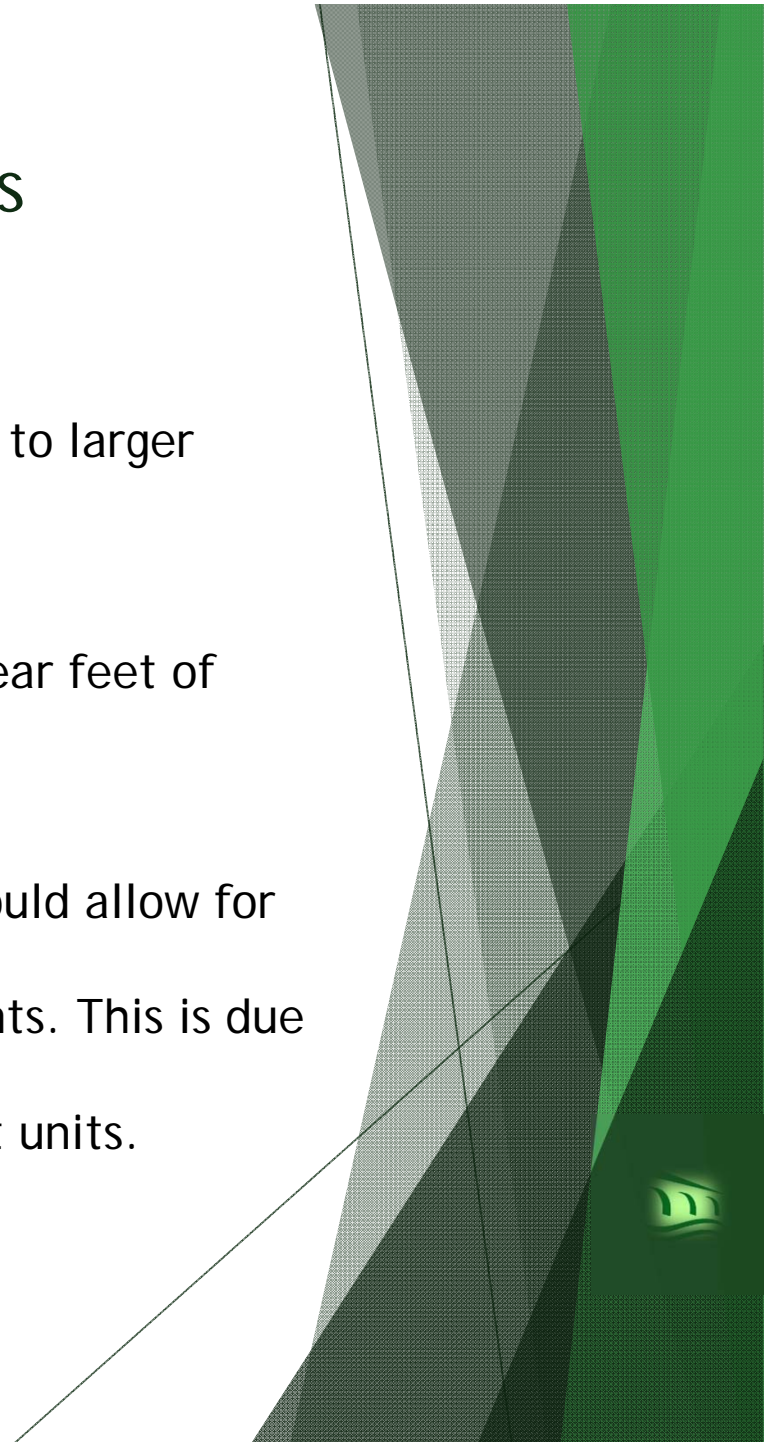
- SMP'S TO MEET WQ REQUIREMENT:

Green Roof, Porous Pavement, Subsurface Infiltration, Tree Disconnection

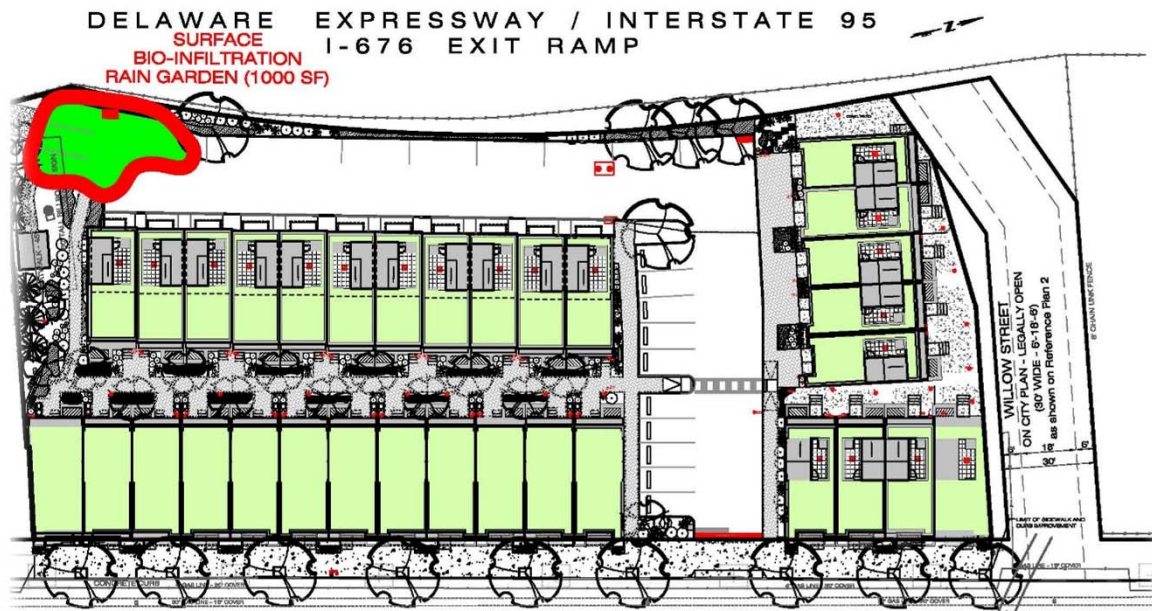
- Remaining 16,000 SF DCIA treated by subsurface infiltration basin with 8:1 loading ratio

Approach #1 Conclusions

1. No SMP's added or removed
2. Subsurface Infiltration Basin reduced in size due to larger loading ratio
3. Less site excavation required, elimination of linear feet of pipe, elimination of neoprene liner
4. Smaller subsurface infiltration basin footprint could allow for more units to have basements or larger basements. This is due to greater separation from basin to the adjacent units.



Approach #2



- SMP'S TO MEET WQ REQUIREMENT:

Green Roof, Porous Pavement, Bio-Infiltration, Tree Disconnection

- Project is eligible for new expedited Surface Green Review
- Remaining 16,000 SF DCIA treated by rain garden with 16:1 loading ratio

Approach #2 Conclusions

1. Bio-Infiltration Rain Garden added
2. Subsurface Infiltration Basin removed
3. Less site excavation required, elimination of multiple precast structures, removal of 3 parking spaces
4. With the larger loading ratio it would be possible to add a few smaller rain gardens and not need to eliminate parking

