# GWK Drainage District
## Multi-Community Collaboration
### Stormwater Standards

## Wednesday, February 27

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# Today's Agenda

- Introductions
- Project Overview:  Zoning & Design Opportunities for Use of Green Infrastructure
- Current Stormwater/Detention Standards
- Proposed Stormwater/Detention Standards and Implications for Planners
- Site Plan Examples
- Questions, Comments, Barbed Remarks

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# Team Introductions

- GWK Community Staff
- Oakland County
  - Jim Nash
  - Anne Vaara
  - Jim Wineka
  - Joel Kohn
- Consultants
  - JB Hinds, Birchline Planning
  - Greg Kacvinsky, OHM Advisors
  - Valerie Novaes, OHM Advisors
  - Nancy Russell, OHM Advisors

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# Definitions:

- Are these familiar?
- Are any problematic?
- What are we missing?

- Channel Protection Volume Control (CPVC)
  - Regardless of existing runoff volume potential, all development sites (when feasible) shall capture and infiltrate the runoff for the first inch of rainfall
- Channel Protection Rate Control (CPRC)
  - Extended detention (48-hour dewatering) of the site runoff volume generated from the 1.9-inch rainfall event.
- Maximum Extent Practicable (MEP)
  - Flexibility within regulations to comply with requirements
- Detention
  - Runoff from a development site is stored and released at an allowable release rate back into the system
- Infiltration
  - Water that soaks into the ground from a development site

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# What's happening in the GWK

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# Summary of Current Stormwater/ Detention Standards in the GWK District

- Detention requirements affect project COST (especially underground detention) and DESIGN (i.e. surface pond vs. underground, amount of area disturbed)
- Some areas of agreement on detention requirements, but some substantial differences
- Only one community as a Channel Protection Volume Control (CPVC) standard
- Feedback and clarification needed on detention standards
- Today's objective:
  - ***Put current practice into context of proposed Regional Stormwater Standards Coordination Committee (RSSCC)***
  - ***Look at implications for site plans and designs***

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# What site development/ redevelopment triggers flood control requirements?

- All developments or redevelopments (6 Communities)
- >6,100 SF new or renovated area (3 Communities)
- 3,500 SF new (1 Community)
- All development but only the area being developed (1 Community)
- Required only if the outlet is incapable of handling development runoff (2 Communities)
- Don't specify the threshold in code (2 Communities)

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# What Design Storm Event is Used to Size Detention?

- Design storm affects the amount of water that must be stored = $$$ of underground detention OR size/ footprint of ponds
- Wide range of requirements within the district
  - 4 Communities don't specify or require detention
  - 7 Communities design for the 10-year
  - 1 Community designs for the 25-year
  - 1 Community design for the 100-year
- "The median standard:" Control 10-year storm to 0.2 cfs/ac using Oakland County Calculations for new or redevelopment of 3,000-6,000 SF or greater.

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# Proposed Standard: Channel Protection Volume Control (CPVC)

## Proposed Criteria

- Capture and infiltrate, to the maximum extent feasible, the runoff from the first 1-inch of rainfall over the entire site
- Maximum extent feasible is based on
  - In-situ infiltration capacity (proposed ranges)
    - > 0.5 inch/hour = YES, capacity to infiltrate
    - < 0.5 but >0.1 inch/hour = Yes, with an elevated underdrain
    - <0.1 inch/hour = NO, not feasible to infiltrate the first 1-inch of rainfall
  - Presence of high groundwater
  - Soil contamination
- If not feasible to infiltrate the 1-inch rainfall, water quality criteria of 80% TSS removal or max discharge concentration of 80 mg/l still required

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# Channel Protection Rate Control (CPRC)

- **Extended detention** (48-hour dewatering) of the site runoff volume generated from a **1.9-inch rainfall event**. Extended detention will be required for all sites to the MEP. This provides peak flow control for storms up to the 2-yr/24-hr storm.
- On smaller brownfield (i.e. redevelopment) sites: The 1.9 inch criteria will provide a storage volume that approaches (or in some cases equals) the 10-year volume requirement.
- **Implication:**
  - **In most cases, this will be roughly equivalent to detention volume already required**
  - **Volume can be reduced when implementing infiltration BMPs**

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# What do the proposed standards look like on a site?

…the suspense is killing us…

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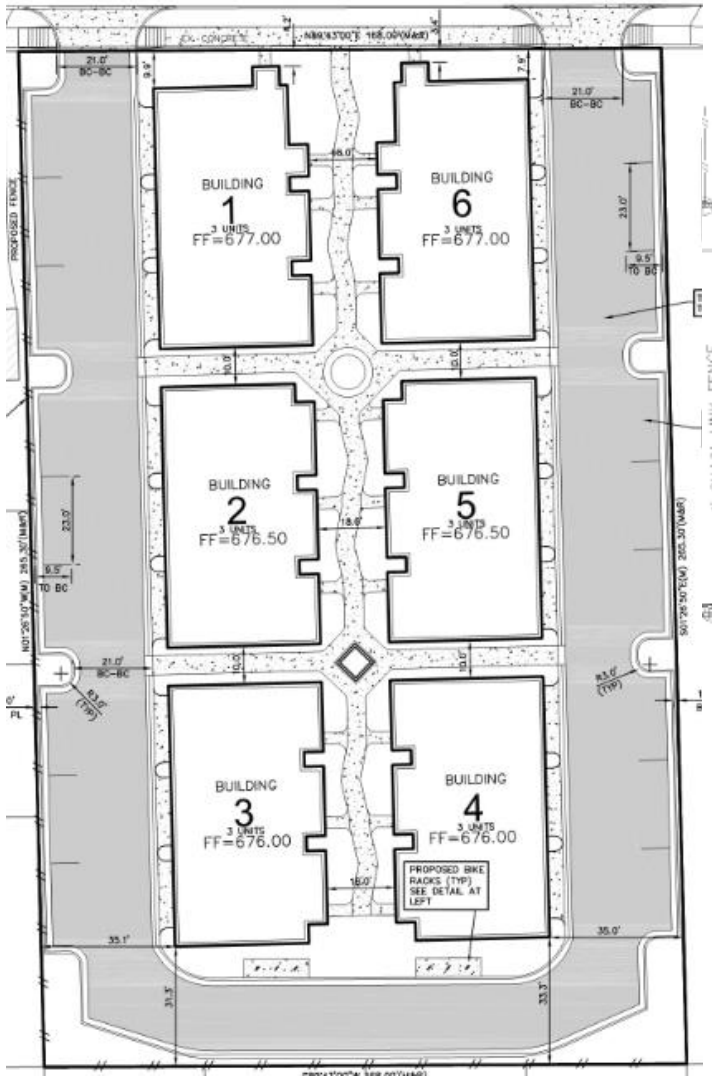
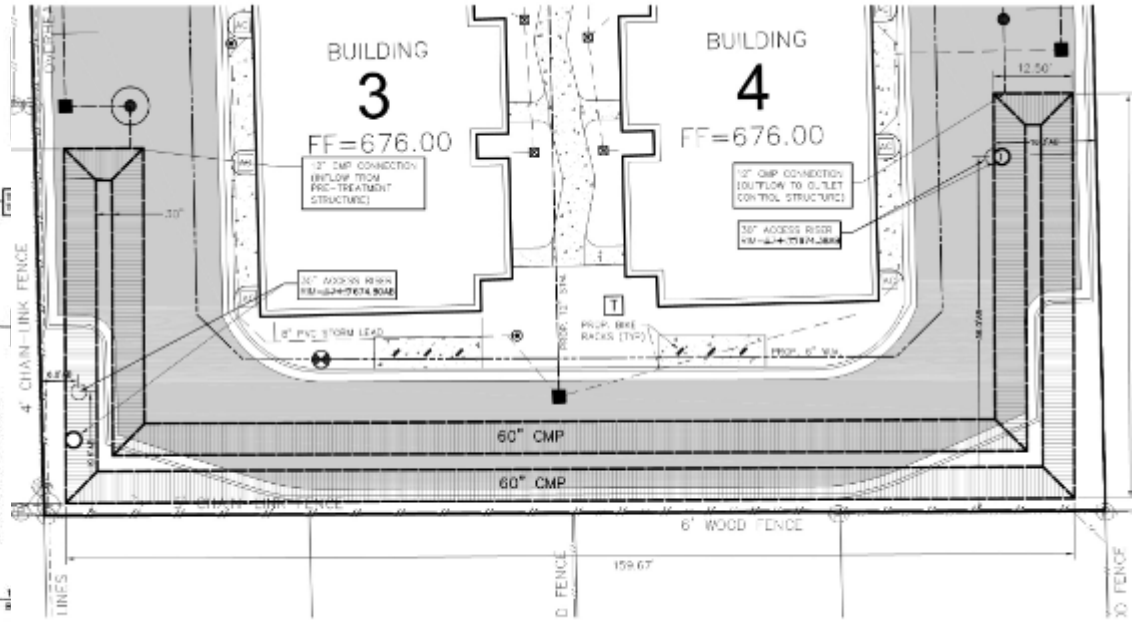
# Site Plan Example #1: Six-building multi-family, infill site




UNDERGROUND DETENTION STORAGE PLAN

| Area | Runoff C | Storage Volume (cf) |
|---|---|---|
| 1.5 | .76 | 10,014 |

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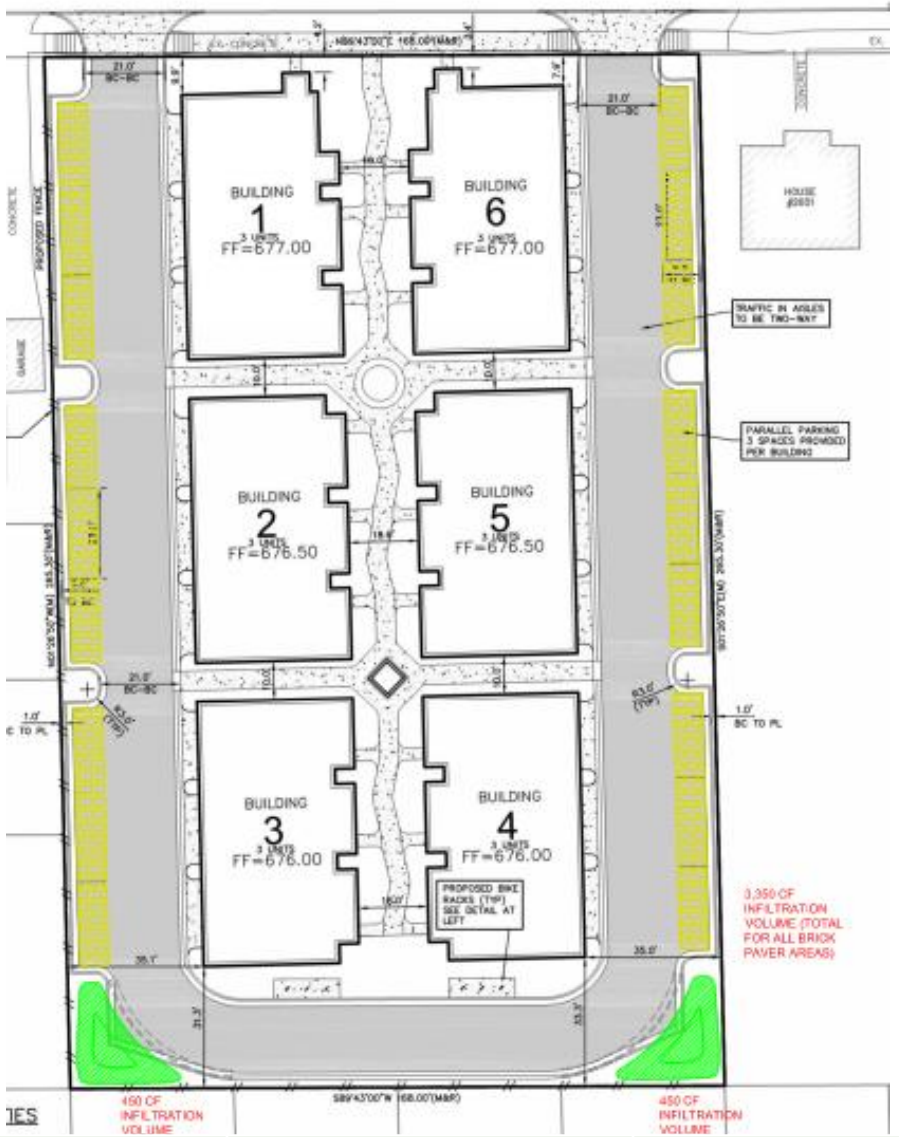
# Site Plan Example #1:

- Green Infrastructure manages 4,250 CF
- Example: Permeable pavers in the parking stalls + bioretention / deep rooted planting at corners




| Area | Runoff C | Channel Protection Volume Control (CPVC) First 1" | 1.9 Extended Detention Storage (CPRC) | Green Infrastructure Infiltration Volume | Required Remaining Storage |
|---|---|---|---|---|---|
| 1.5 | .76 | 4,138 cf | 7,863 cf | 4,250 cf | 3,613 cf |

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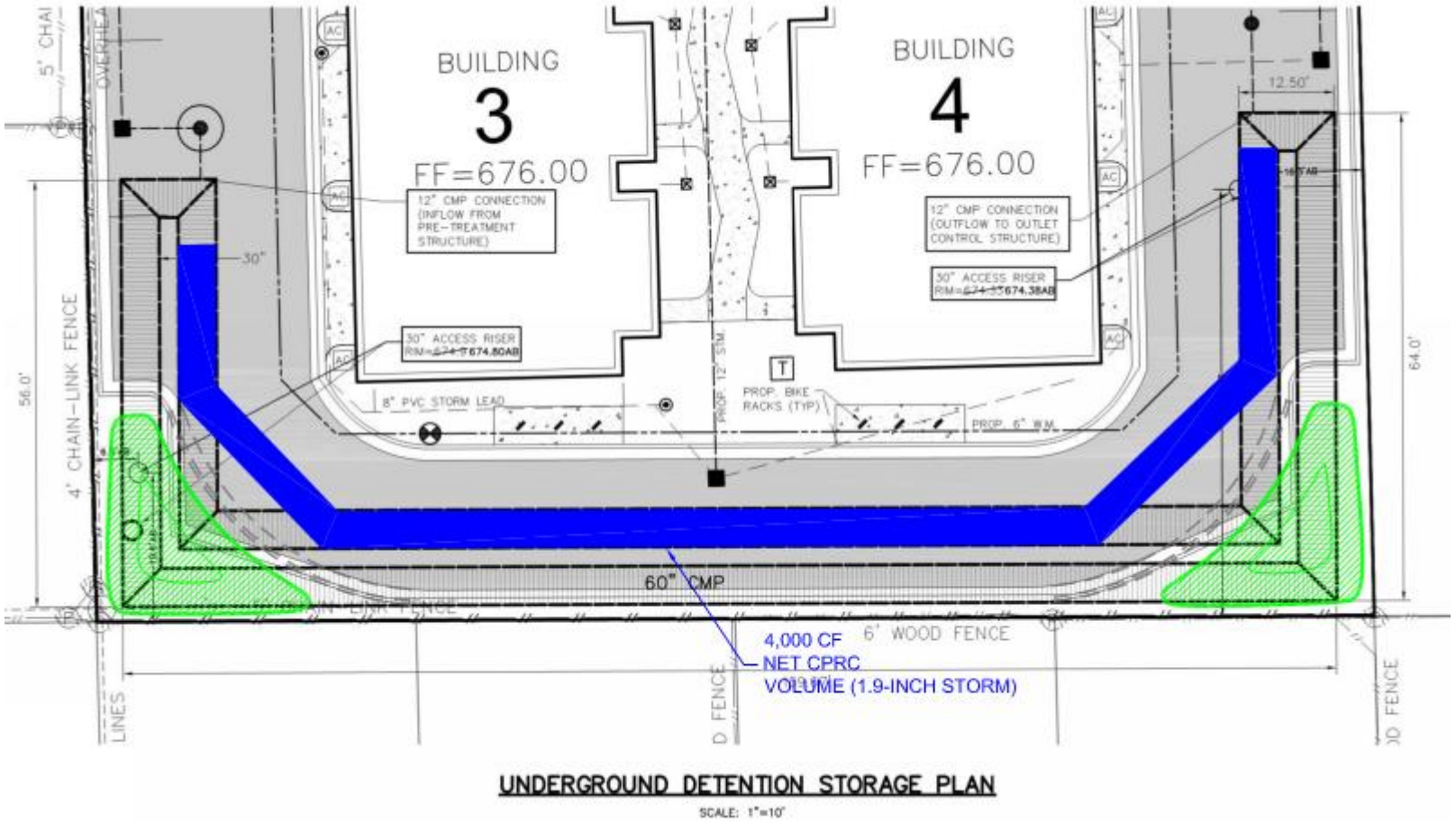
# Detention volume: Underground storage for additional 4,000 CF




UNDERGROUND DETENTION STORAGE PLAN

SCALE: 1"=10'

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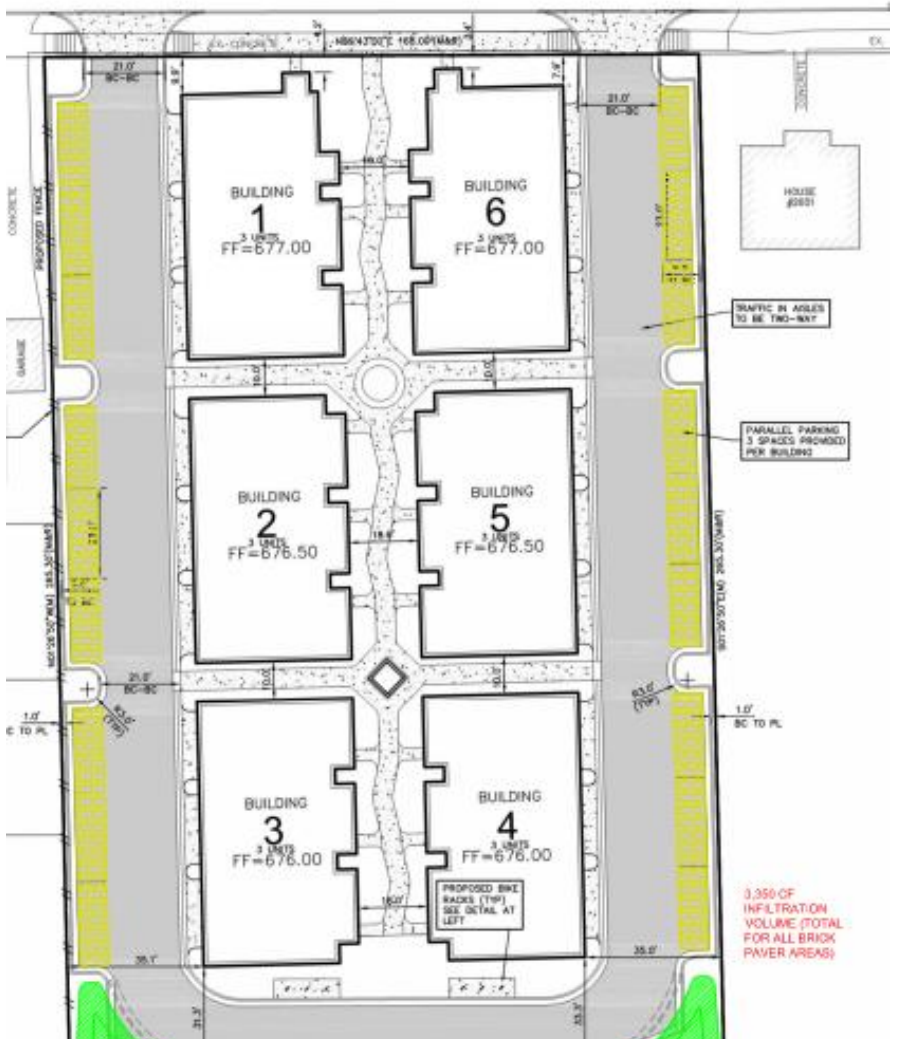
# CHALLENGE: Applicable code prohibits (at least on paper!) permeable surfacing




**Sec. 138-500. - Construction.**

All parking areas shall be provided with paving having an asphaltic or portland cement binder so as to provide a permanent, durable, and dustless surface. All parking areas shall be graded and drained so as to dispose of all surface water accumulated within the area according to Oakland County requirements prior to the issuance of an occupancy permit. All drives shall be provided with paving having a portland cement binder so as to provide a permanent, durable, dustless surface.

(Ord. No. O-06-00, § 1, 7-17-2000; Ord. No. O-04-08, § 1, 10-20-2008)

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# Site Plan Example #1

## Stormwater Management Planning Comparison

| Original Site Plan | | Green Infrastructure | |
|---|---|---|---|
| Underground Storage | 510 LF 60-inch CMP @ $300/LF = $153,000 | Pervious Pavement | 2,910 SF @ $14*/SF cost differential = $41,000 |
| | | Bioretention | 900 CF @ $16*/CF = $14,400 |
| | | Underground storage | 200 LF 60-inch CMP @ $330/LF = $66,000 |
| **TOTAL** | **$ 153,000** | **TOTAL** | **$121,400** |
| ***Total annual reduction in flows to combined sewer: 890,000 gallons*** | | | |

*Functions as part of landscape budget

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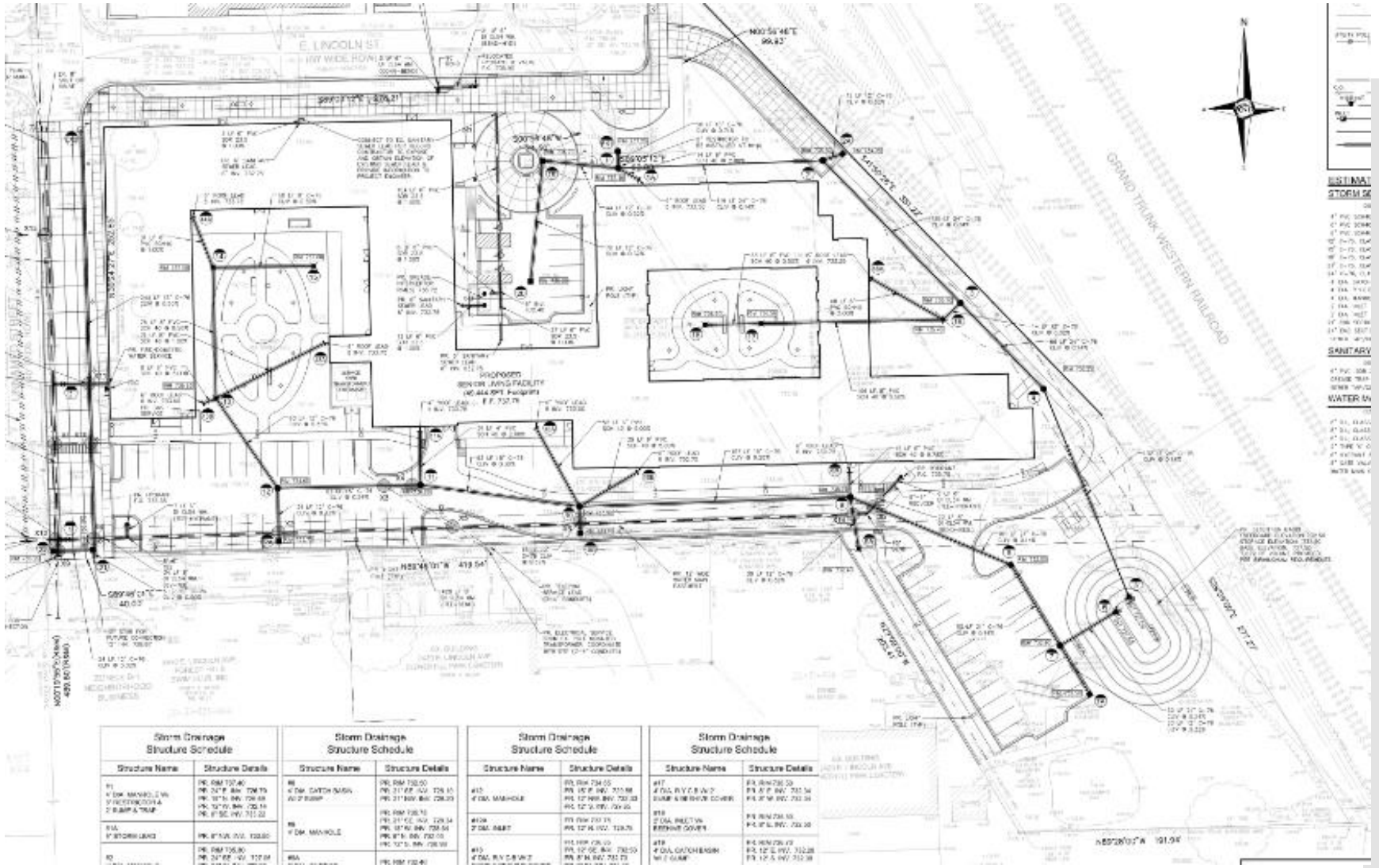
# Site Plan Example #2: Lifecare Facility




| Area | Runoff C | Storage Volume (cf) |
|---|---|---|
| 4.17 | .66 | 7,659 |

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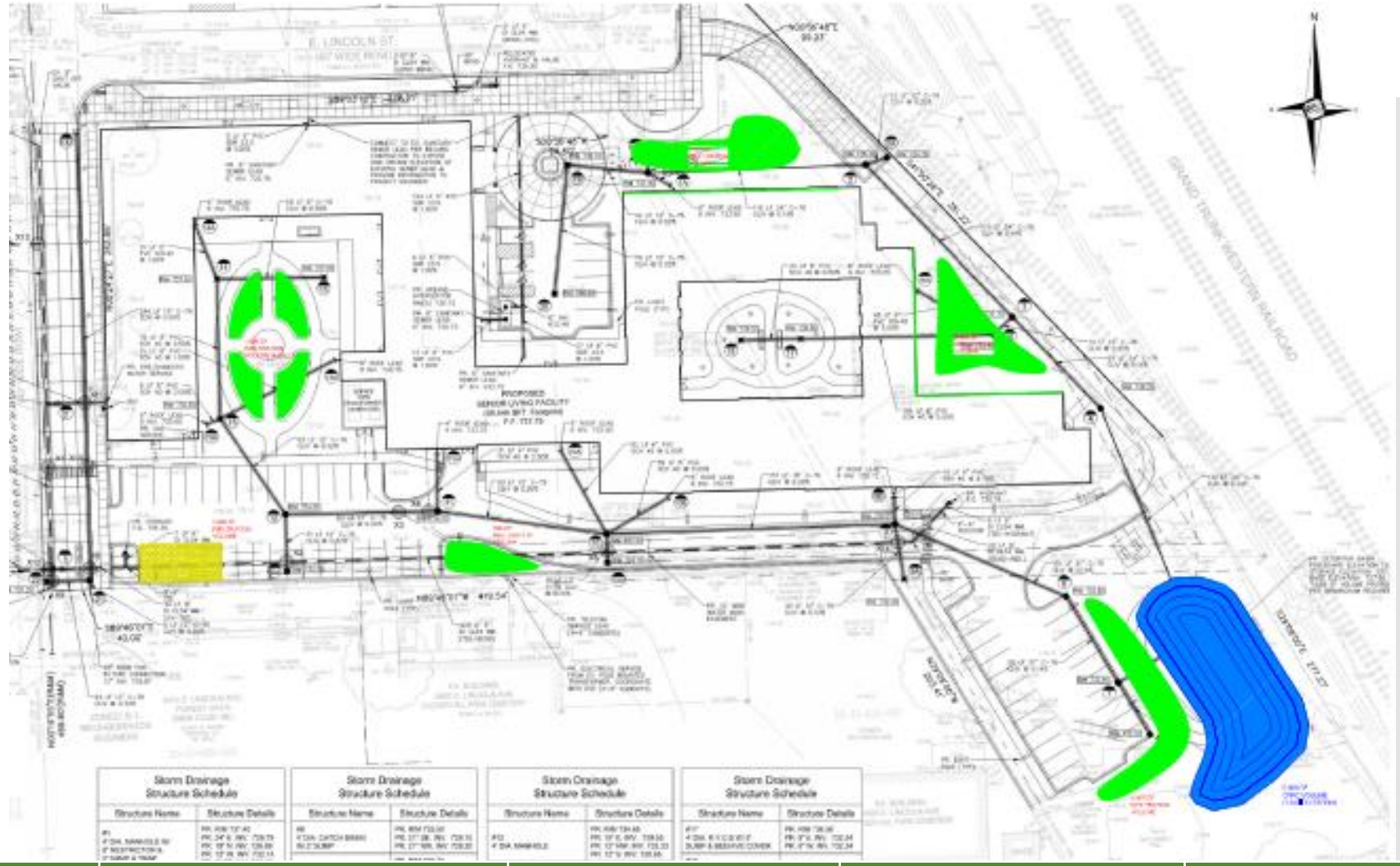
# Site Plan Example #2:

- Green infrastructure manages @ 10,000 cf
- Example: Bioretention in landscaped areas, and permeable surfacing
- Detention storage: Pond



| Area | Runoff C | Channel Protection Volume Control (CPVC) First 1" | 1.9 Extended Detention Storage | Green Infrastructure Infiltration Volume | Required Remaining Storage |
|---|---|---|---|---|---|
| 4.17 | .66 | 9,990 cf | 18,982 cf | 9,990 cf | 8,992 cf |

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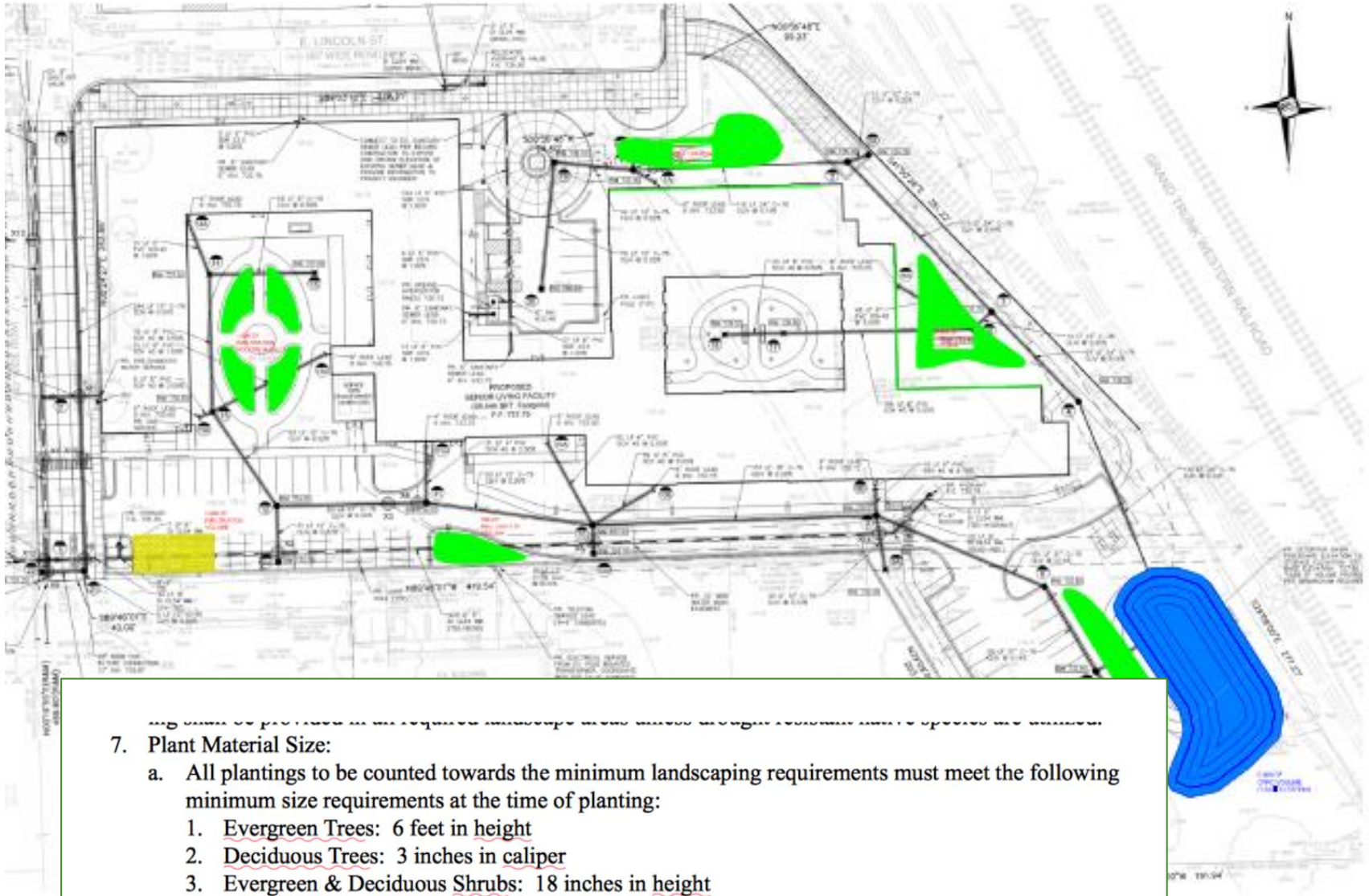
# CHALLENGE:

- Language in landscaping standards doesn't *exactly* support bioretention
- Waiver allowed for 'innovative' landscaping …is GI an 'innovation"?
- How would bioretention plants be 'counted' towards required material?
- Will developers get delayed asking for a waiver from the Planning Commission?



7. Plant Material Size:
   a. All plantings to be counted towards the minimum landscaping requirements must meet the following minimum size requirements at the time of planting:
      1. Evergreen Trees: 6 feet in height
      2. Deciduous Trees: 3 inches in caliper
      3. Evergreen & Deciduous Shrubs: 18 inches in height
   b. All replacement plantings for dead or diseased plant materials must meet the same minimum size requirements as new plantings.
8. Native Species Credit: The use of species native to the region is encouraged. A reduction of 20% of the total number of trees or shrubs required will be granted if 80% or more of the trees and/or shrubs to be planted are native species. The Staff Arborist maintains a complete list of all native species.

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# Site Plan Example #2

## Stormwater Management Planning Cost Comparison

| Original Site Plan | | Green Infrastructure | |
|---|---|---|---|
| Detention Pond | 7,700 CF @ $2/CF = $15,400 | Pervious Pavement | 915 SF @ $14*/SF cost differential = $12,800 |
| Landscape | $$$ | Bioretention | 8,990 CF @ $13*/CF = $117,000 |
| | | Detention Pond | 8,992 CF @ $2/CF = $18,000 |
| **TOTAL** | **$ 15,400** | **TOTAL** | **$148,000** |
| ***Total annual reduction in flows to combined sewer: 2.15 million gallons*** | | | |

*Functions as part of landscape budget

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# What planning strategies and tools can facilitate compliance with new stormwater standards?

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# Make clear how bioretention plants "count" towards planting requirements

Table 15-5.0302 Standard Plant Units

| | Planting Size | | Land Use Type | | |
|---|---|---|---|---|---|
| Planting Type | Minimum Diameter/ Size | Minimum Height | Multi-Family | Commercial, Industrial, Office & Similar | Manufacturing/ Industrial |
| Canopy/ Shade Tree | 3" diameter @ 6" above root flare | | 1.5/ dwelling unit | 1/ 5 parking spaces | 1/10 parking spaces |
| Evergreen Tree OR | | 6' | 1/ dwelling unit | 1/ 5 parking spaces | 1/10 parking spaces |
| Ornamental Tree | 3" diameter @ 6" above root flare | | | | |
| Evergreen Shrub OR | 18" wide | | 1/ dwelling unit | 1/ 5 parking spaces | 1/10 parking spaces |
| Large Deciduous Shrub | | 3' | | | |
| Small Flowering Shrubs OR | | 18" | 3/ dwelling unit | 1/ 5 parking spaces | 1/10 parking spaces |
| Native Grasses/ Forbs OR | 1 gallon pot | | | | |
| Bioretention Plantings | 3" - 4" pot (or as specified by Landscape Architect) | | Per storm water mgmt. plan; Max. Spacing 18" on center; 9 SF = one 18" small flowering shrub or 1 gallon pot of native grasses/forbs | | |
| | | | | | |

For purposes of this Section, bioretention plantings shall be equivalent to small flowering shrubs or native grasses/forbs at a rate of 9 SF of plantings per large deciduous shrub, small flowering shrub, or native grass/forb.

1 Gallon native grass/ forb counts as a "small flowering shrub"

Every 9 SF of bioretention area counts as one "small flowering shrub" or "native grass/ forb"

REDUCED requirement for large shrubs and ornamental trees

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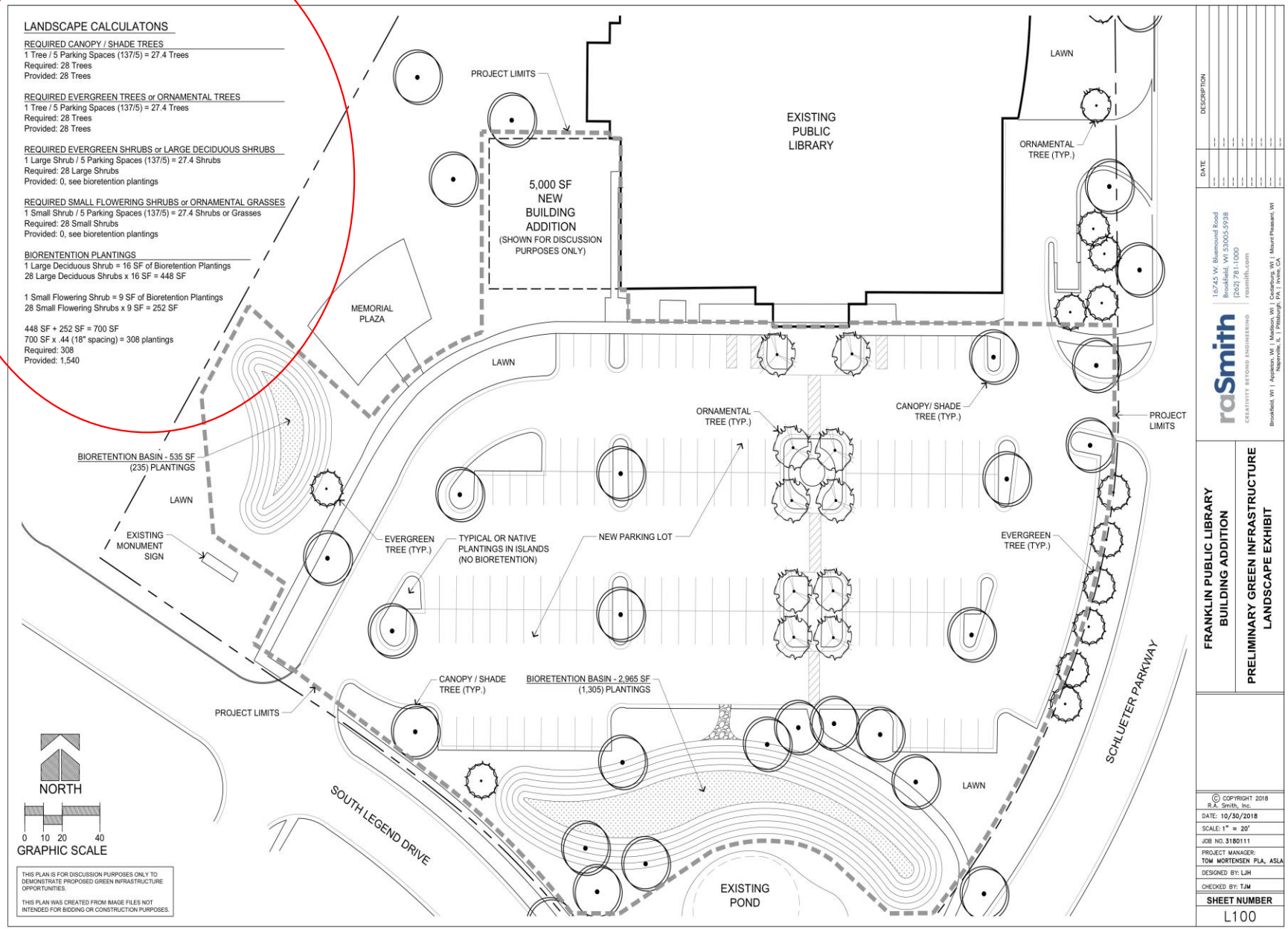
# Site Plan with bioretention plantings "counting" towards required shrubs

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# Site Plan with bioretention plantings "counting" towards required shrubs

REQUIRED CANOPY / SHADE TREES
1 Tree / 5 Parking Spaces (137/5) = 27.4 Trees
Required: 28 Trees
Provided: 28 Trees

REQUIRED EVERGREEN TREES or ORNAMENTAL TREES
1 Tree / 5 Parking Spaces (137/5) = 27.4 Trees
Required: 28 Trees
Provided: 28 Trees

REQUIRED EVERGREEN SHRUBS or LARGE DECIDUOUS SHRUBS
1 Large Shrub / 5 Parking Spaces (137/5) = 27.4 Shrubs
Required: 28 Large Shrubs
Provided: 0, see bioretention plantings

REQUIRED SMALL FLOWERING SHRUBS or ORNAMENTAL GRASSES
1 Small Shrub / 5 Parking Spaces (137/5) = 27.4 Shrubs or Grasses
Required: 28 Small Shrubs
Provided: 0, see bioretention plantings

BIORENTENTION PLANTINGS
1 Large Deciduous Shrub = 16 SF of Bioretention Plantings
28 Large Deciduous Shrubs x 16 SF = 448 SF

1 Small Flowering Shrub = 9 SF of Bioretention Plantings
28 Small Flowering Shrubs x 9 SF = 252 SF

448 SF + 252 SF = 700 SF
700 SF x .44 (18" spacing) = 308 plantings

*Birchline Planning LLC/ RA Smith National*

# Example: Option for amendments to Oak Park's zoning (runs away)

5. *Interior landscaping.* For every new development, except in R-1 and R-2 residential districts, interior landscaping areas shall be provided, equal to at least at least ten percent of the total lot area. These landscaped areas may be grouped near building entrances, building foundations, pedestrian walkways, service areas or adjacent to fences, walls, or rights-of-way, and may include vegetated stormwater control measures where designed as part of an approved stormwater management plan. All interior landscaping shall be designed to the following general design standards, subject to planning commission approval:

   (a) One two-inch caliper deciduous tree, or one five-foot high evergreen tree, for every 400 square feet of required interior landscaping area.

   (b) Two eighteen-inch high or wide shrubs, or four deep-rooted or native plants in a minimum one-gallon pot size or equivalent, shall be required for every 400 square feet of required interior landscaping area.

   (c) The interior landscaping area shall be covered with deep-rooted or native plants, grass, ground cover, wood chips, mulch, or any combination of the above, and may incorporate vegetated stormwater control measures.

A one-gallon pot size is roughly equivalent to an 18" shrub in terms of initial appearance

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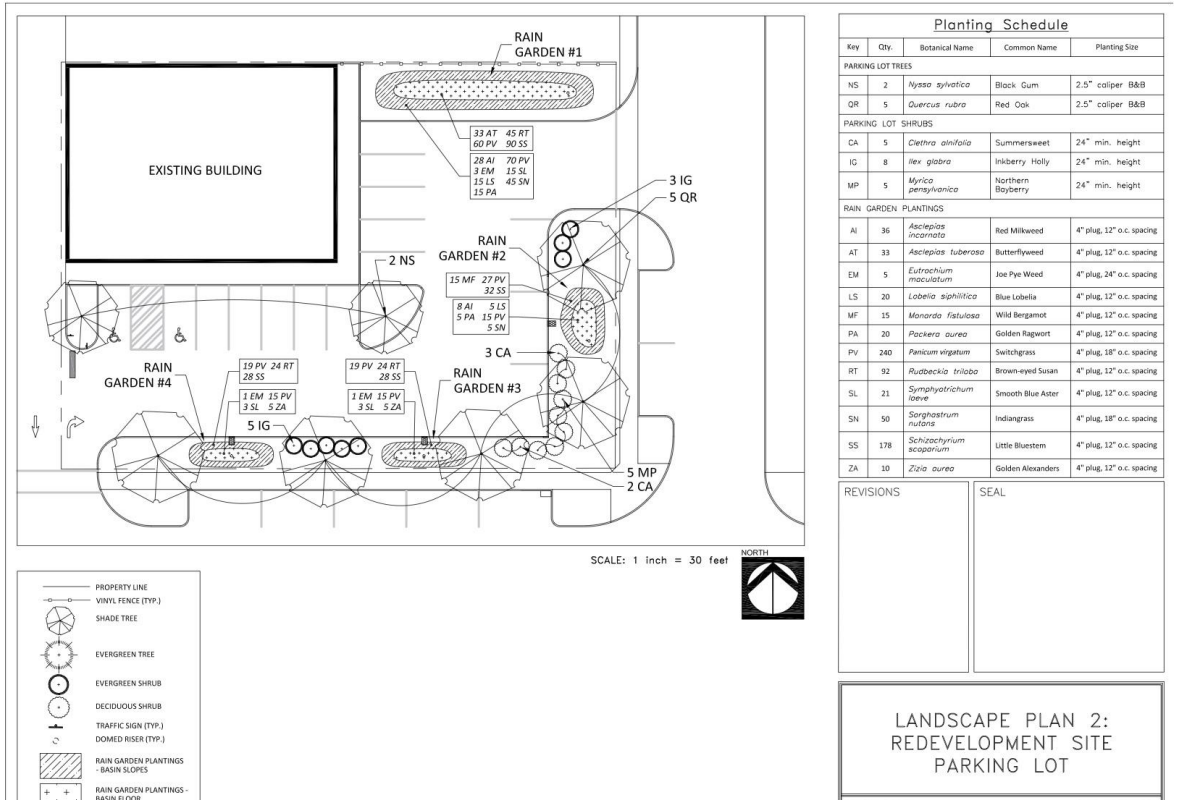
| | MOISTURE LEVEL | | | SUN LEVELS | | | PLANT TYPE | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Plant Common Name | Wet | Medium | Dry | Full | Part | Shade | Perennial | Shrub | Grass/ Sedge/Rush | Tree |
| Swamp Milkweed | X | X | | X | X | | X | | | |
| New England Aster | X | X | | X | | | X | | | |
| Purple Stemmed Aster | X | X | | X | X | | X | | | |
| Smooth Aster | | X | X | X | | | X | | | |
| Joe Pye Weed | X | X | | X | X | | X | | | |
| Purple-Headed Sneezeweed | X | X | | X | | | X | | | |
| Swamp Rose Mallow | X | X | | X | | | X | | | |
| Cardinal Flower | X | X | | X | X | | X | | | |
| Blue Lobelia | X | X | | X | X | | X | | | |
| Black Eyed Susan (Rudbeckia flugida') | X | X | | X | X | | X | | | |
| Black Eyed Susan (Rudbeckia hirta) | | X | X | X | X | | X | | | |
| Seedbox | X | X | | X | X | | X | | | |
| Bee-Balm | | X | X | X | | | X | | | |
| Beardtongue | | X | X | X | | | X | | | |
| Mountain Mint | X | X | | X | X | | X | | | |
| Green-Headed Coneflower | X | X | | X | | | X | | | |
| Golden Ragwort | X | X | | X | X | | X | | | |
| Swamp Goldenrod | X | X | | X | X | | | | X | |
| Lance-Leaved Goldenrod | X | | | X | | | X | | | |
| Sedge | X | X | | X | X | | | | X | |
| Golden Alexanders | X | X | | X | X | | X | | | |
| Fox Sedge | X | X | | X | X | | | | X | |

| | MOISTURE LEVEL | | | SUN LEVELS | | | PLANT TYPE | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Plant Common Name | Wet | Medium | Dry | Full | Part | Shade | Perennial | Shrub | Grass/ Sedge/Rush | Tree |
| Blue Flag Iris | X | X | | X | X | | X | | | |
| Hardstem Bullrush | X | | | X | | | | | X | |
| Prairie Dropseed | | X | | X | | | | | X | |
| Red Chokeberry | X | | | X | X | | | X | | |
| Black Chokeberry | X | X | | X | X | | | X | | |
| *Button Bush (tall - screening)* | X | X | | X | X | | | X | | |
| Red Oiser Dogwood | X | X | X | X | X | X | | X | | |
| Summersweet Clethra | X | X | | X | X | | | X | | |
| Silky Dogwood | X | X | | X | X | X | | X | | |
| Winterberry Holly | X | X | | X | X | | | X | | |
| Prairie Willow | | X | X | X | | | | X | | |
| *Lowbush Blueberry (screening - away from roads/ parking)* | X | X | X | X | X | X | | X | | |
| *Highbush Blueberry* (screening - away from roads/ parking)* | X | X | | X | X | | | X | | |
| *American Cranberry Bush (tall - screening)* | | X | | X | X | | | | | X |
| Arrowwood Viburnum | X | X | | X | X | | | X | | |
| Nannyberry | X | X | | X | X | | | | | X |
| Swamp Rose Bush | X | X | | X | X | | | X | | |
| Musclewood | X | X | | X | X | X | | | | X |
| Canadian Redbud | | X | | X | X | | | | | X |
| Black Gum | X | X | X | X | X | | | | | X |
| Swamp White Oak | X | X | | X | | | | | | X |
| Sycamore | X | X | X | X | | | | | | X |

# Plant Specifications:

- Many GWK zoning codes have recommended plant lists!
- Would a recommended plant list for integrated bioretention help?



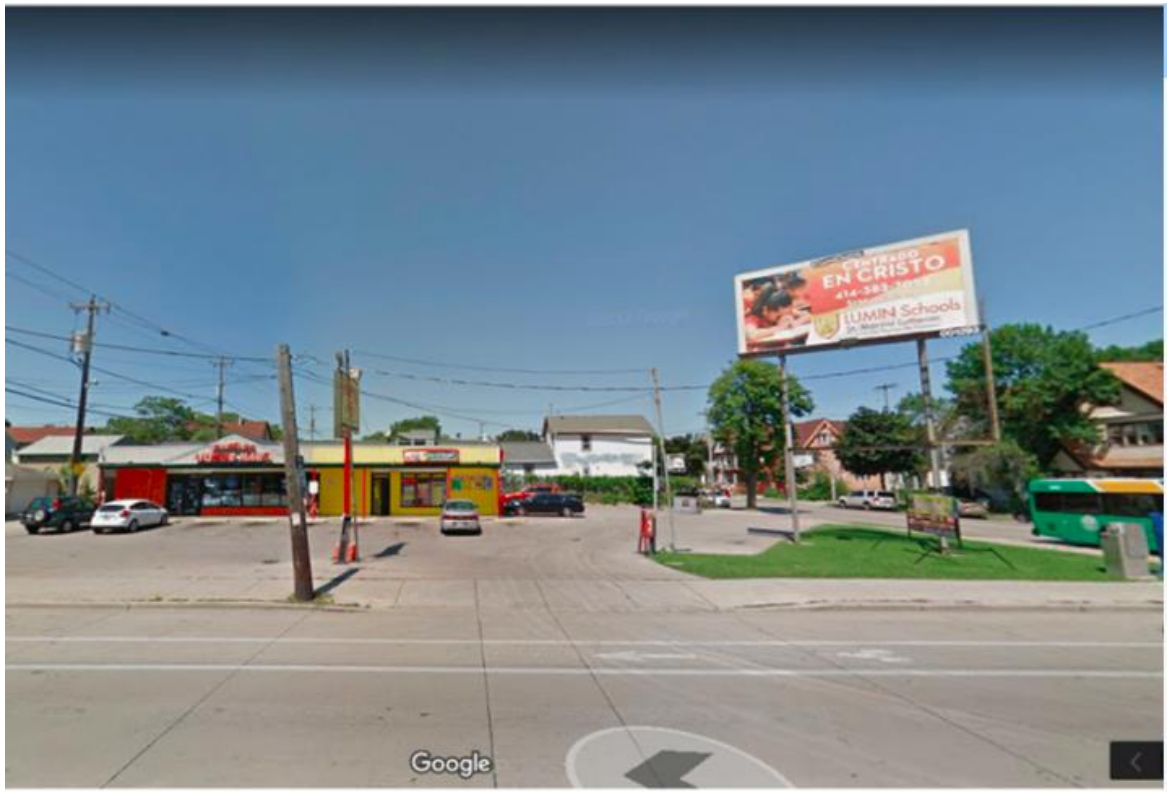

Planting Schedule

| Key | Qty. | Botanical Name | Common Name | Planting Size |
|---|---|---|---|---|
| PARKING LOT TREES | | | | |
| NS | 2 | *Nyssa sylvatica* | Black Gum | 2.5" caliper B&B |
| QR | 5 | *Quercus rubra* | Red Oak | 2.5" caliper B&B |
| PARKING LOT SHRUBS | | | | |
| CA | 5 | *Clethra alnifolia* | Summersweet | 24" min. height |
| IG | 8 | *Ilex glabra* | Inkberry Holly | 24" min. height |
| MP | 5 | *Myrica pensylvanica* | Northern Bayberry | 24" min. height |
| RAIN GARDEN PLANTINGS | | | | |
| AI | 36 | *Asclepias incarnata* | Red Milkweed | 4" plug, 12" o.c. spacing |
| AT | 33 | *Asclepias tuberosa* | Butterflyweed | 4" plug, 12" o.c. spacing |
| EM | 5 | *Eutrochium maculatum* | Joe Pye Weed | 4" plug, 24" o.c. spacing |
| LS | 20 | *Lobelia siphilitica* | Blue Lobelia | 4" plug, 12" o.c. spacing |
| MF | 15 | *Monarda fistulosa* | Wild Bergamot | 4" plug, 12" o.c. spacing |
| PA | 20 | *Packera aurea* | Golden Ragwort | 4" plug, 12" o.c. spacing |
| PV | 240 | *Panicum virgatum* | Switchgrass | 4" plug, 18" o.c. spacing |
| RT | 92 | *Rudbeckia triloba* | Brown-eyed Susan | 4" plug, 12" o.c. spacing |
| SL | 21 | *Symphyotrichum laeve* | Smooth Blue Aster | 4" plug, 12" o.c. spacing |
| SN | 50 | *Sorghastrum nutans* | Indiangrass | 4" plug, 18" o.c. spacing |
| SS | 178 | *Schizachyrium scoparium* | Little Bluestem | 4" plug, 12" o.c. spacing |
| ZA | 10 | *Zizia aurea* | Golden Alexanders | 4" plug, 12" o.c. spacing |

REVISIONS

SEAL

LANDSCAPE PLAN 2:
REDEVELOPMENT SITE
PARKING LOT




*Theurkauf Design & Planning/Birchline Planning LLC*

# How would a site plan with that plant list apply to a typical commercial redevelopment?

# Discussion

- Questions, concerns about proposed stormwater standards
- Additional site plan examples that would be helpful?
- Which code change approaches seem reasonable?  What support/info is needed?
- Making specific code changes vs. adopting/ referring to new technical guidance (or both)
- Other strategies to support plan development & review

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