PERKINS EASTMAN

Human by Design

THE ART + SCIENCE OF COST-EFFECTIVE HIGH PERFORMANCE BUILDINGS:

HOW DATA INFORMS OUTCOMES

SESSION DESCRIPTION

Creating high-performance buildings requires a balance of art and science. Design decisions can no longer be guided by aesthetics and intuition alone; they require careful study to achieve desired outcomes. Using recent work in the Northeast, this session will show how data can be used to inform design decisions. Case studies will cover how data from both predictive analysis as well as post-occupancy evaluation was used to answer the following questions:

- Can we provide Harvard-recommended CO2 levels without increasing energy?
- How can sunshades be optimized to reduce system sizing and glare?
- What is the best affordable wall assembly for this climate?
- How does high-performance compare to code compliance in terms of cost?
- To what degree can we replace typical civil infrastructure with biosystems?

LEARNING OBJECTIVES

- Detail an energy-efficient wall assembly for the Northeast that minimizes moisture accumulation overtime.
- Design window systems that are optimized to reduce energy, improve daylight distribution, and minimize glare.
- Determine appropriate occupancy calculations to estimate CO2 levels.
- Investigate the cost of Biosystems in fulfilling local stormwater requirements against typical civil infrastructure.

AGENDA

INTRO

SITE

ENERGY + ENVELOPE

IEQ

CONCLUSIONS

Boston Arts Academy
Perkins Eastman

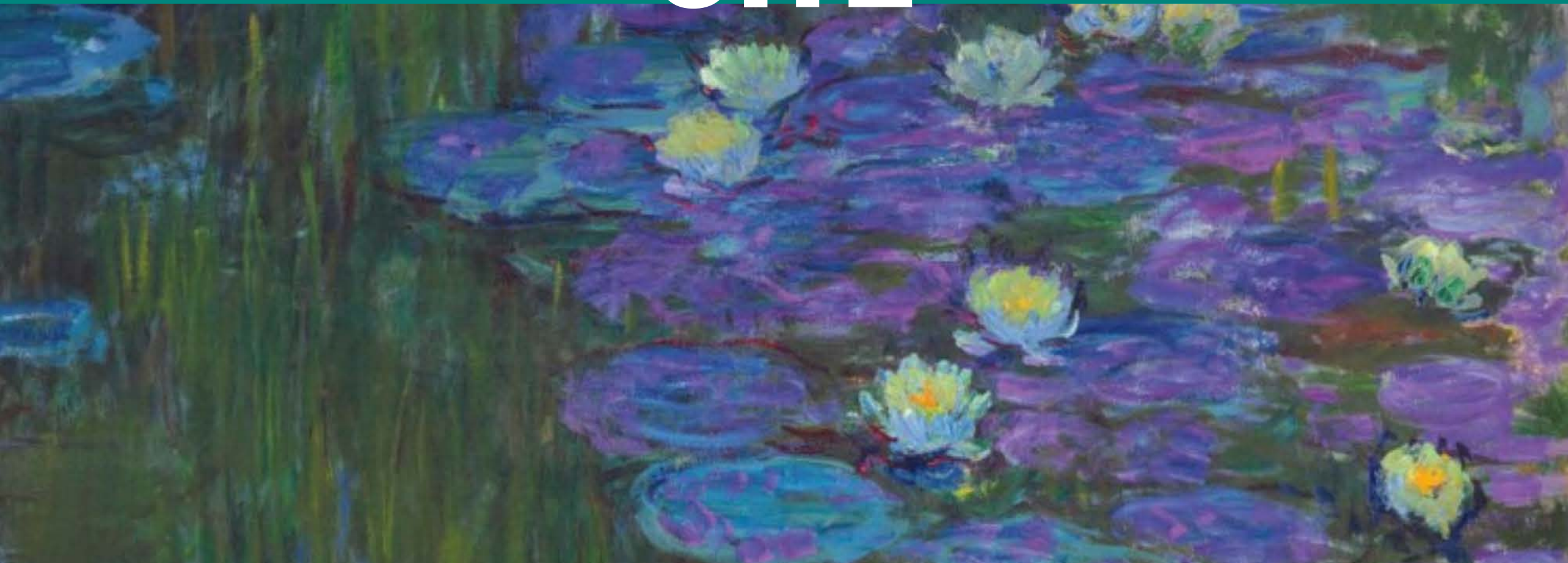
How could data be used to inform design decisions?

Audience
Input

THE USE OF DATA

- Clients asking for it
- Garbage in / Garbage Out
- Misrepresentation (looking at the wrong thing)
- Holistic interpretation (systems integration vs. isolation)

SITE



BROOKS SCHOOL

Location: North Andover, MA

Use: High School Science

Square Footage: 32,000 sf

Floors: 2

Brooks School
Architerra, Dan Arons, Principal
Photography: Chuck Choi

STRATEGIES

BROOKS SCHOOL

SITE PLAN

Brooks School
Architerra, Dan Arons, Principal

STRATEGIES

BROOKS SCHOOL

Stage 1: Green Roof

- Slows runoff
- Evapotranspiration
- Learning environment

Brooks School
Architerra, Dan Arons, Principal

GREEN ROOF

Brooks School
Architerra, Dan Arons, Principal
Photograph, Chuck Choi

STORMWATER STRATEGIES

BROOKS SCHOOL

Stage 2: Rainwater Garden

- Slows runoff
- Infiltration
- Storage
- Learning Environment

RAINWATER GARDEN

Brooks School
Architerra, Dan Arons, Principal

STRATEGIES

BROOKS SCHOOL

SUNY COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

Location: Syracuse, NY

Use: Conference, Student Center, Admissions & Center

Square Footage: 52,000 sf

Floors: 3

Brooks School
Architerra, Dan Arons, Principal
Photograph, David Lamb

STORMWATER STRATEGIES

SUNY COLLEGE OF ENVIRONMENTAL STUDIES AND FORESTRY

- Slowing runoff.
- Parking lot converted.
- Creating Habitat
- Trees wells – infiltration
- Lengthening the path of the water – slowing and filtered

Brooks School
Architerra, Dan Arons, Principal
Photograph, David Lamb

GREEN ROOF

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GREEN ROOF

Brooks School
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GREEN ROOF

LANGLEY TERRACE

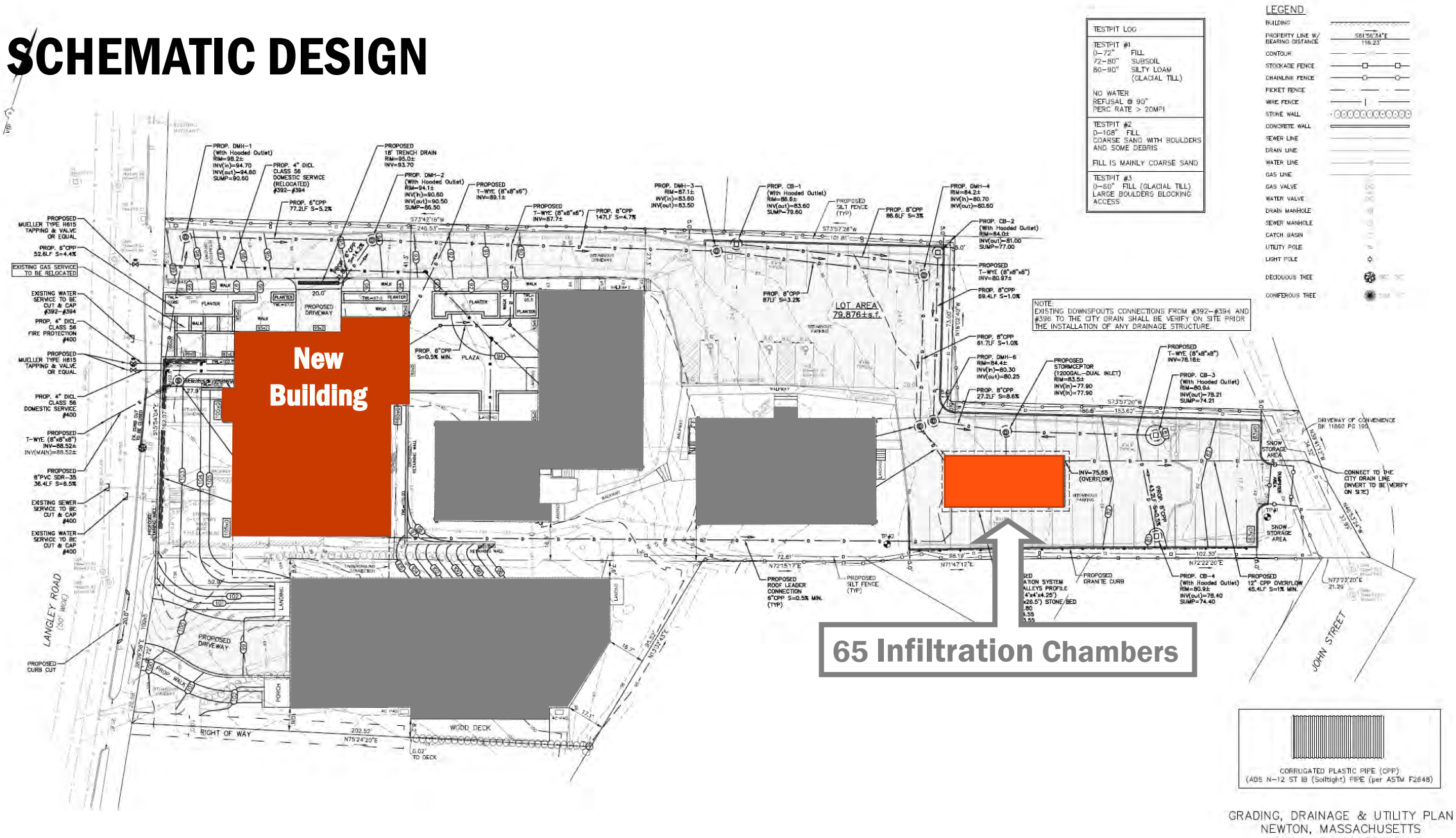
Location: Newton, MA

Use: Residential – 20 units

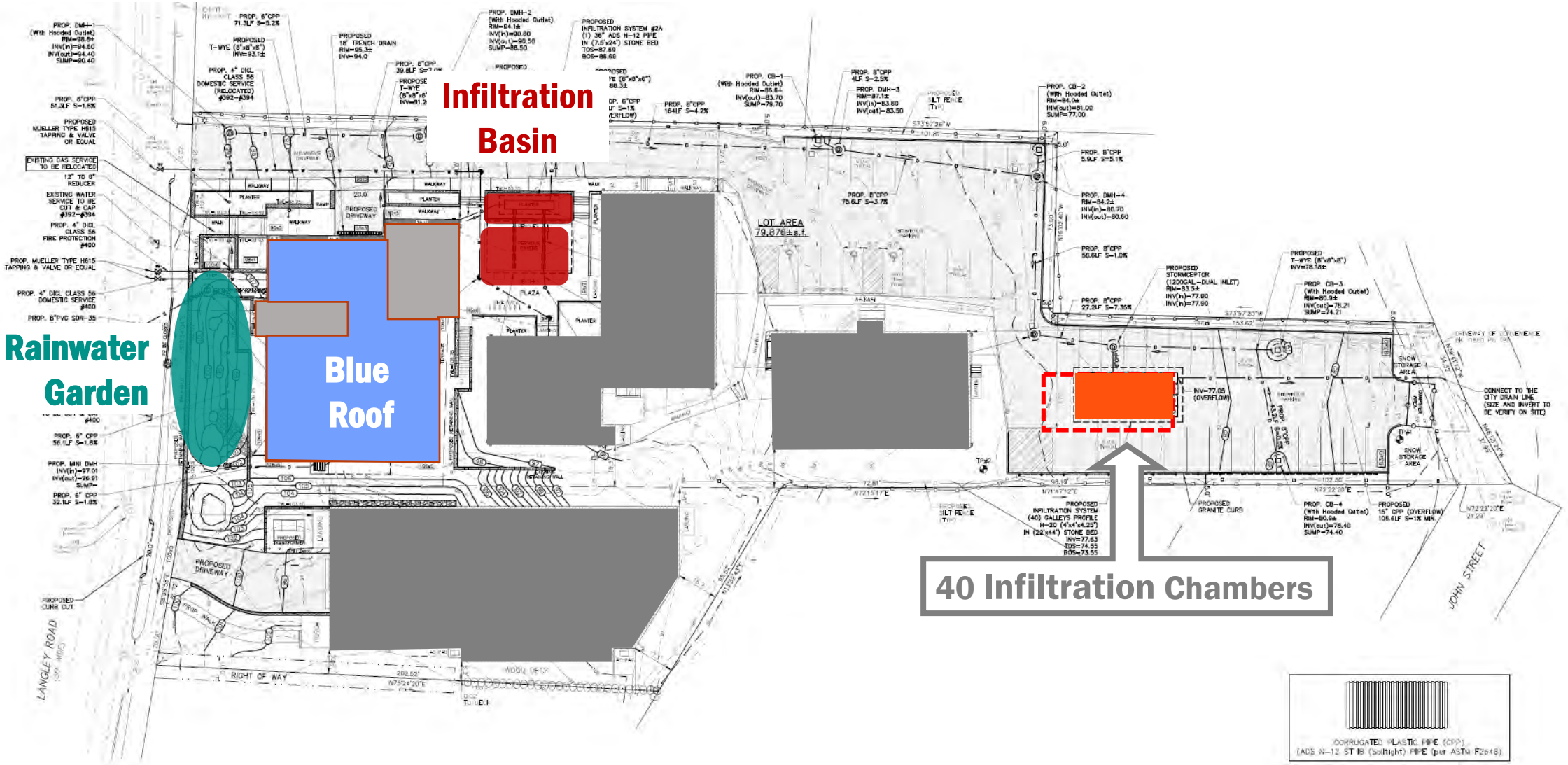
Square Footage: 26,000 sf

Floors: 3 + parking under

SCHEMATIC DESIGN



CONSTRUCTION DOCUMENTS



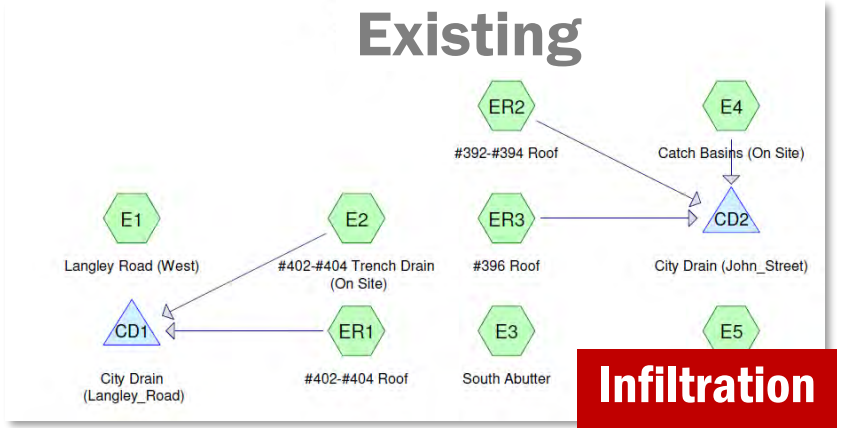
RAINWATER GARDEN

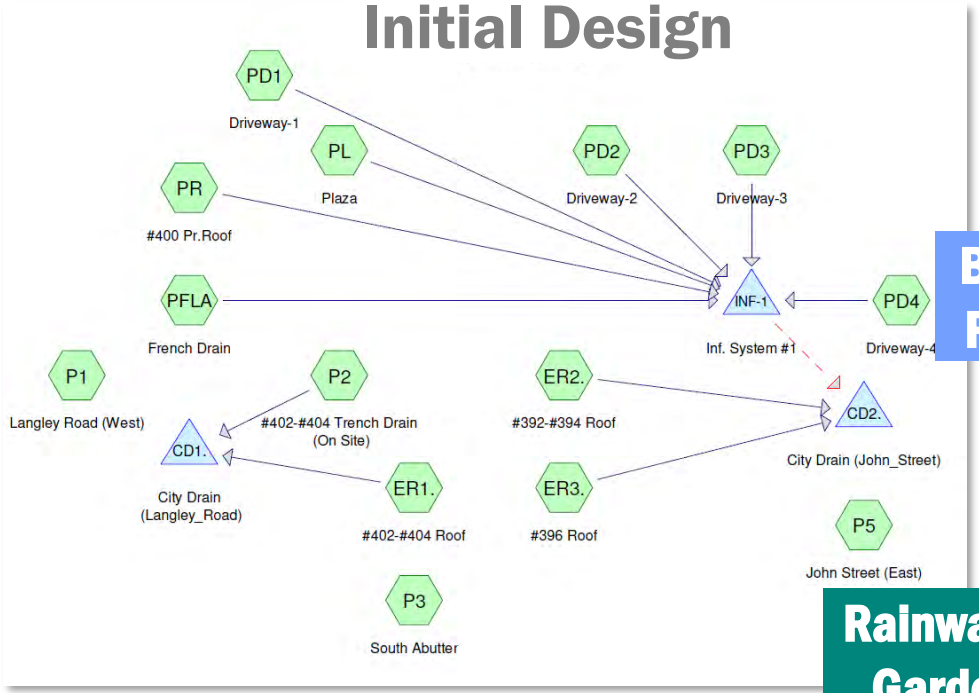
Langley Terrace
Perkins Eastman

INFILTRATION PLAZA

Langley Terrace
Perkins Eastman

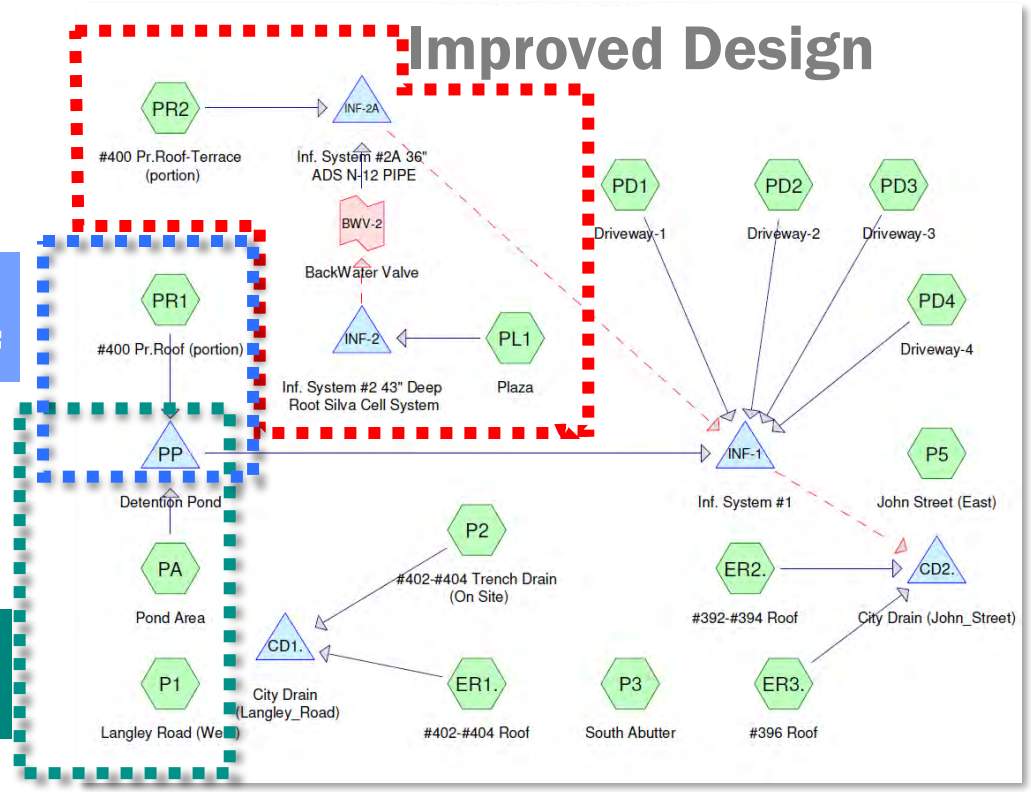
STORMWATER NETWORK





Blue Roof

Rainwater Garden



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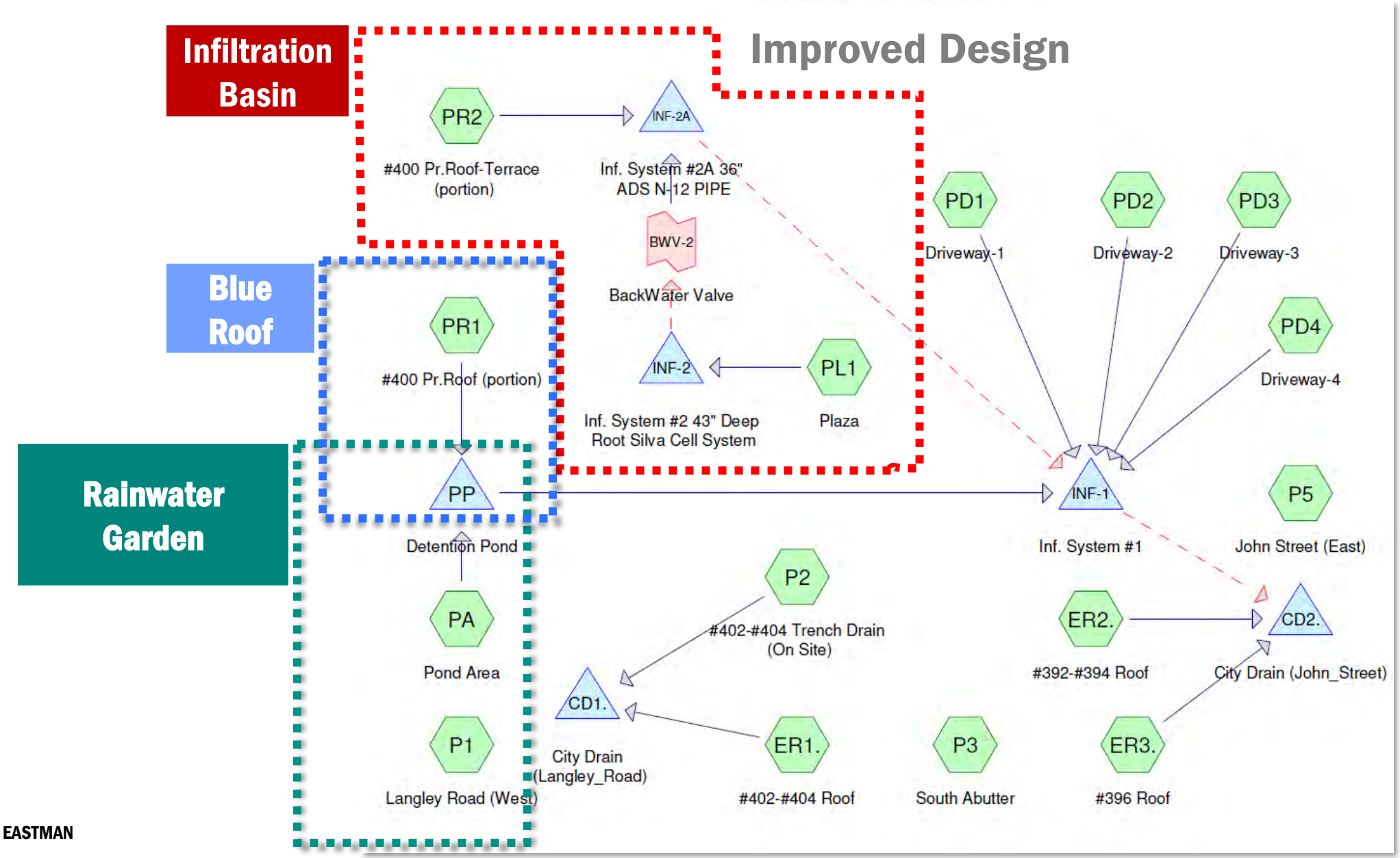
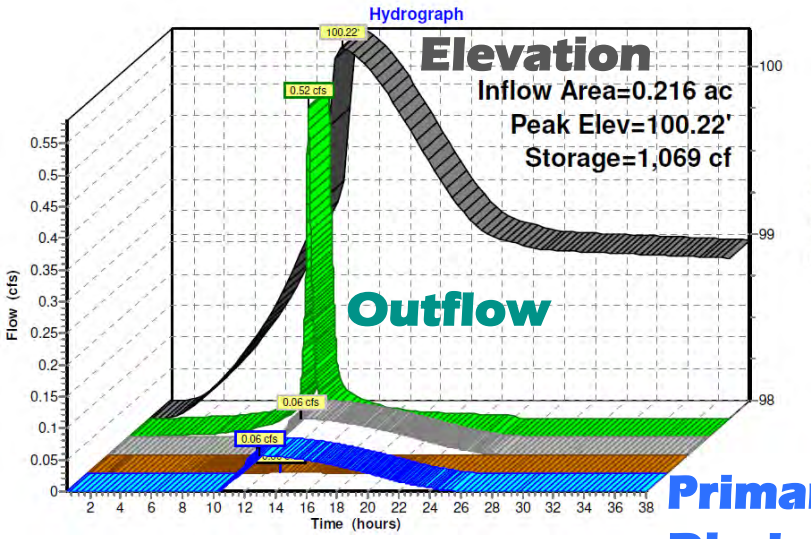
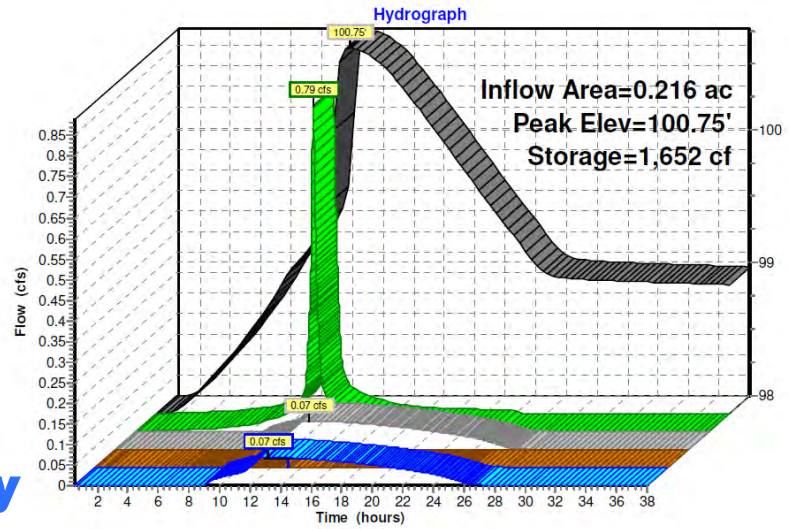


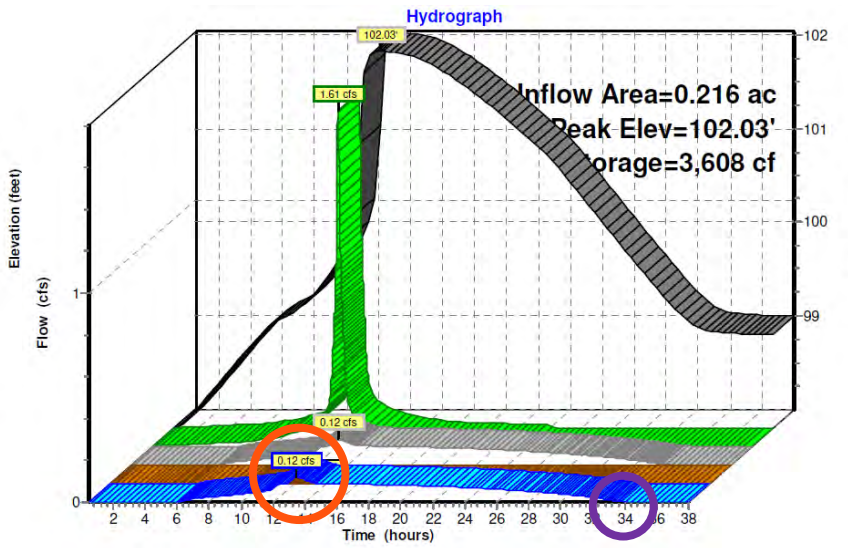
RAINWATER GARDEN PERFORMANCE



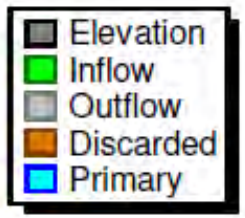
2-Year Rainfall = 3.1”
Peak Outflow=0.06 cfs
Storage=1,069 cf
Discharge = 24 hours



10-Year Rainfall = 4.5”
Peak Outflow=0.07 cfs
Storage=1,652 cf
Discharge = 26 hrs



100-Year Rainfall = 8.8”
Peak Outflow=0.12 cfs
Storage=3,608 cf
Discharge=34 hrs



Langley Terrace
Perkins Eastman

DEVELOPER SETTING

LANGLEY TERRACE, NEWTON, MA

- Blue roof, detention
  - Little cost add
  - 3” retention – no structural add
- Rainwater garden – infiltration, biotranspiration
- Terrace -- collection and infiltration
- “Cultec” chambers – infiltration and discharge
  - Adjust rainwater overflow for detention, standing water, chamber removal.
- **Architect must crawl through the hydrology model**

DR. MARTIN LUTHER KING, JR. SCHOOL

Location: Cambridge, MA

Use: Preschool – Middle School

Square Footage: 168,000 sf

Floors: 4

City of Cambridge, MLK School
Perkins Eastman

SYNERGIES & SYSTEMS THINKING

MLK / PUTNAM AVE SCHOOL, CAMBRIDGE MA

- Local Stormwater Issue
  - Limited Site
  - Storm System Overload
  - Charles River Watershed Pollutants

SYNERGIES & SYSTEMS THINKING

MLK / PUTNAM AVE SCHOOL, CAMBRIDGE MA

- Local Stormwater Issue
  - Storm System Overload
  - Charles River Watershed Pollutants
- Solutions
  - Infiltration: Bioswales & Turf Field
  - “Jelly fish” vs. Rainwater Capture