

Plant Performance in Green Stormwater Infrastructure

Case Study

GREENING LEA ELEMENTARY SCHOOL

4700 LOCUST STREET, PHILADELPHIA PA

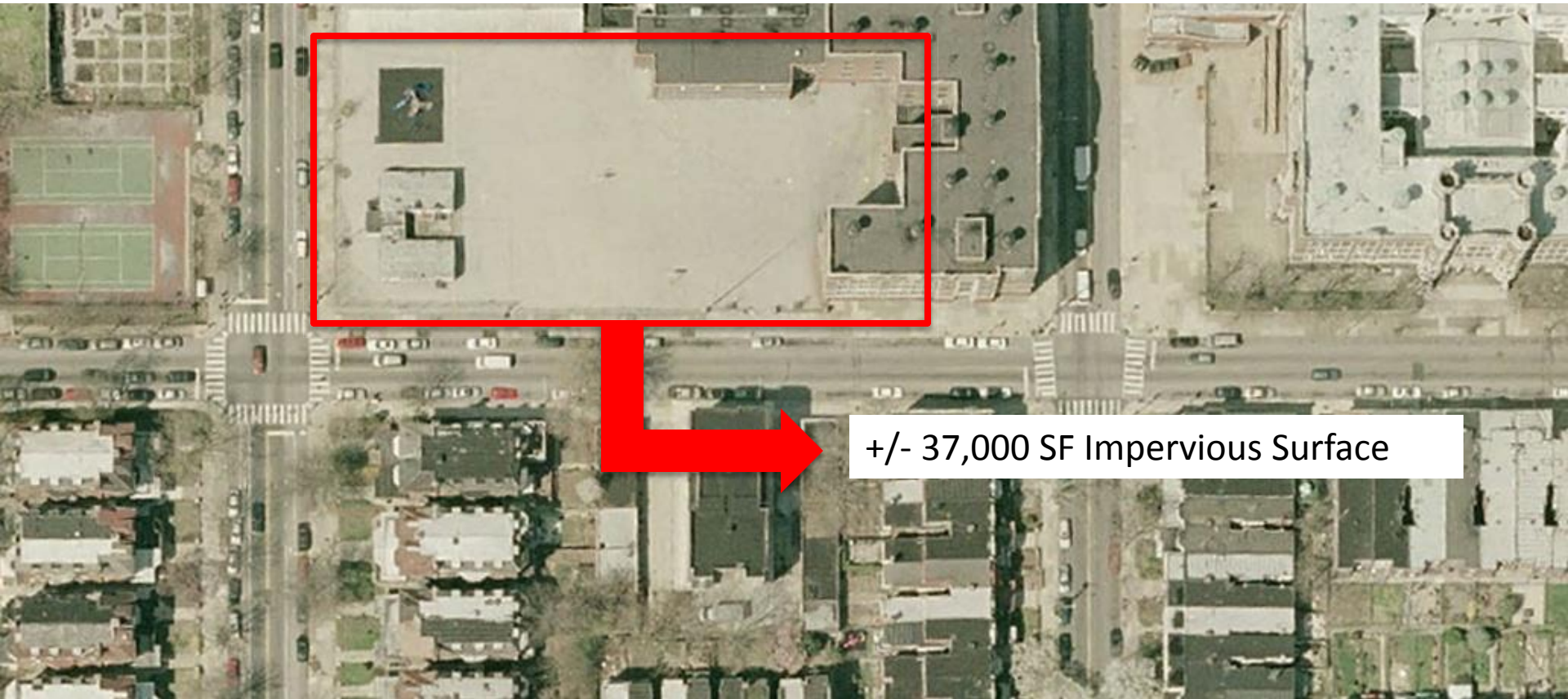


TODAY'S TAKE-AWAY:

1. DEVELOPING A GSI-FRIENDLY SITE PROGRAM
2. IDENTIFYING THE BEST PLANTS
3. PLANT INSTALLATION & COMMUNITY INVOLVEMENT
4. CALCULATING STORMWATER PERFORMANCE
5. IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE
6. KEY DESIGN DECISIONS FOR GSI FUNCTION
7. KEY DESIGN DECISIONS FOR LEA
(and important lessons learned!)

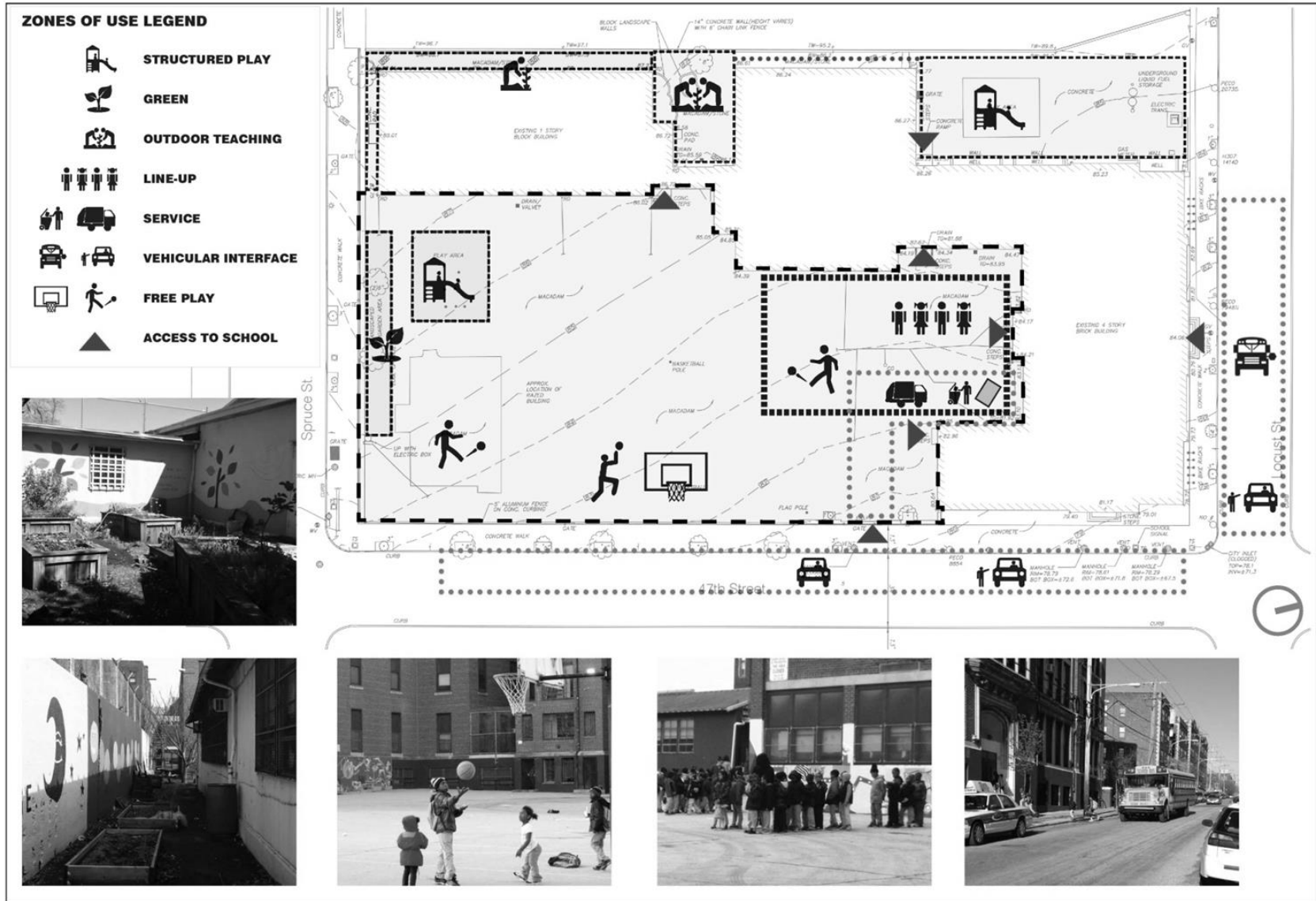
The CHALLENGE:

Designing GSI for a high foot-traffic, recreation-intensive space

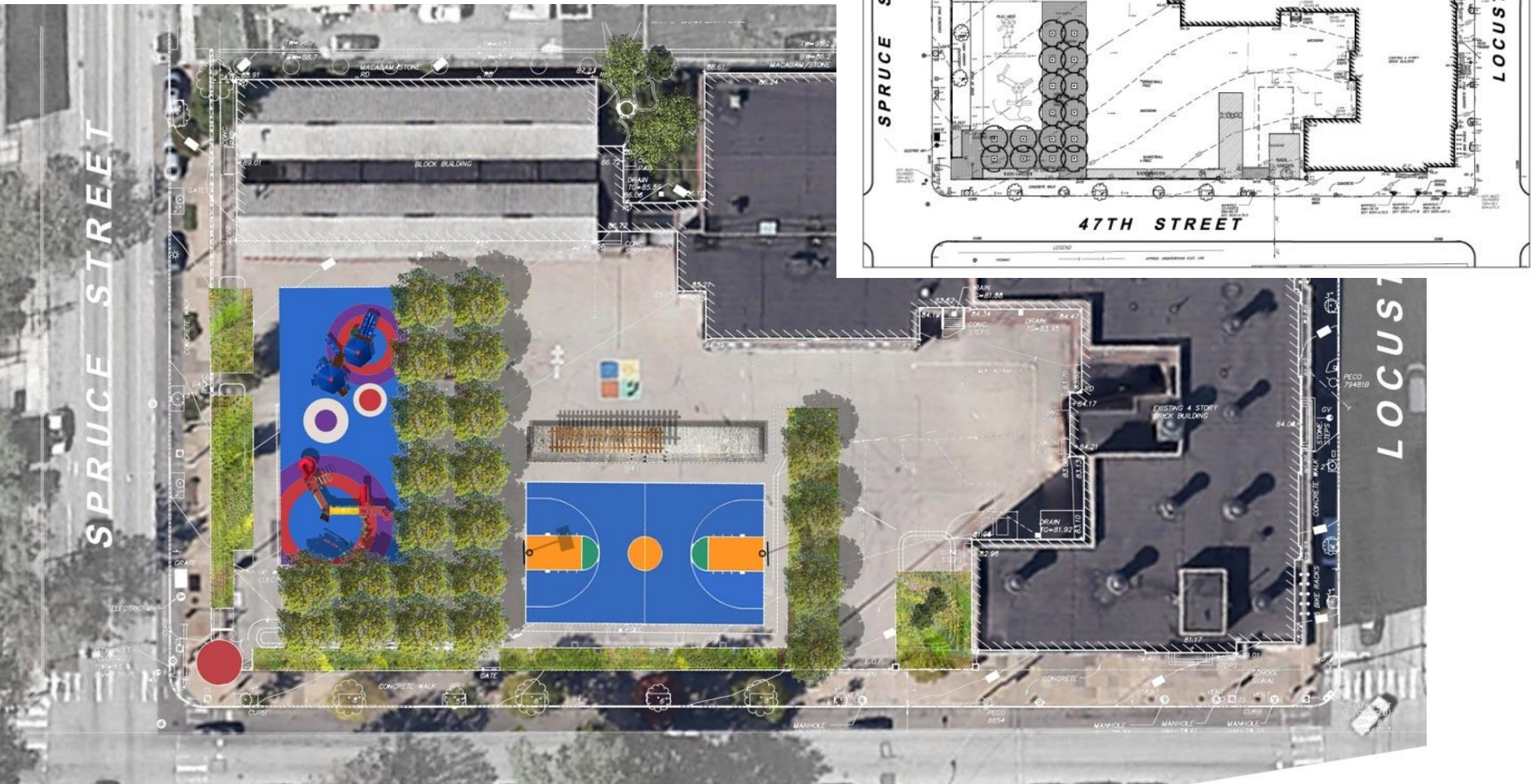


+/- 37,000 SF Impervious Surface

DESIGNING A GSI-FRIENDLY SITE PROGRAM



ANTICIPATING FUTURE USE



SELECTING PLANTS FOR URBAN SURVIVAL

ECO PRIORITIES FOR LEA

- Native, Habitat Value (food and cover), Key Pollinator
- Flood & Drought Tolerant, Pollution-Resistant
- Dense Stem/Large Biomass for Erosion Control
- Combo of cool and warm season grasses

SOCIAL/VISUAL PRIORITIES FOR LEA

- Bold Form, 1 or 2 Signature Colors
- Withstand Moderate Foot-Traffic ***
- Create School Identity through Species & Design
- Ease of Maintenance

OUR CHOICES



PERENNIALS



Acorus gramineus 'Oborozuki'

Sweet Flag



Deschampsia cespitosa Goldtau

Tufted Hair Grass



Eupatorium maculatum Gateway

Joe Pye Weed



Iris Versicolor

Blue Flag



Liatris spicata

Blazing Star



Lobelia cardinalis 'New Moon Maroon'

Cardinal Flower



Matteucia struthiopteris

Ostrich Fern



Panicum virgatum 'Rotstrahlbusch'

Switchgrass

HEALTHY, WELL-ROOTED CONTAINER PERENNIALS



WORK HORSE



Acorus gramineus 'Oborozuki'



**Panicum virgatum
'Rostrahlbusch'**



Aronia arbutifolia

SPARK



**Lobelia cardinalis
'New Moon Maroon'**



**Eupatorium maculatum
'Gateway'**



Liatris spicata

FILLER



Iris versicolor



**Matteuccia
struthiopteris**

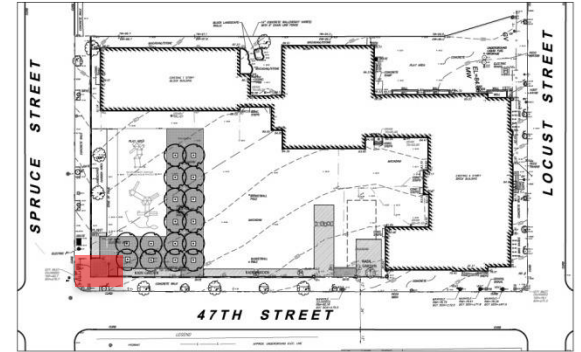


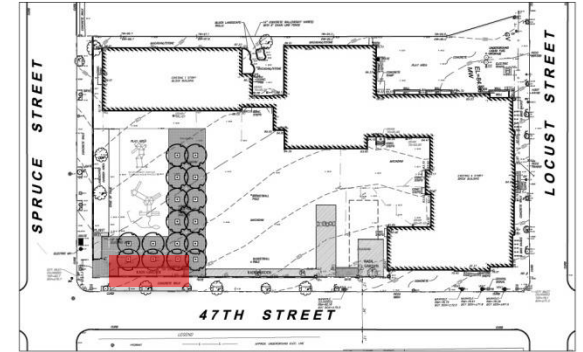
**Deschampsia cespitosa
'Goldtau'**



**Vaccinium
Corymbosum
two cultivars**

GSI TOUR of LEA SCHOOLYARD

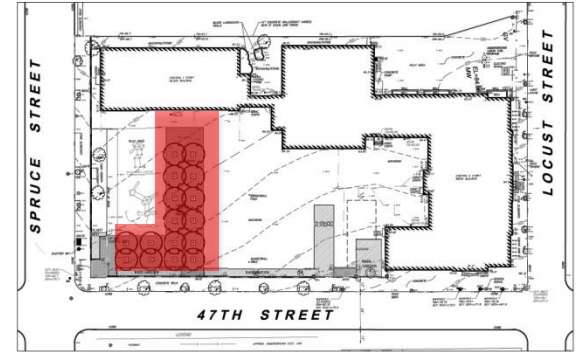


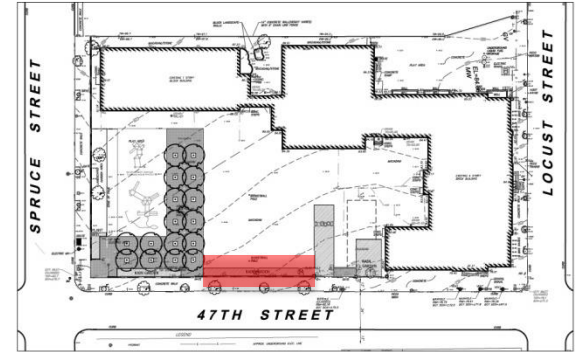


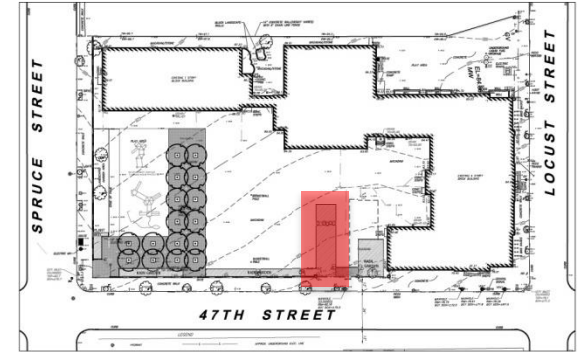


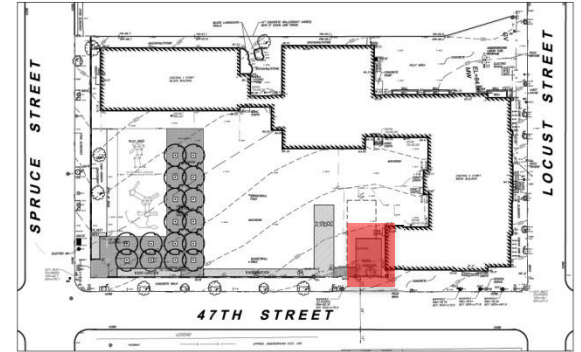
BOSQUE TREES

- Acer rubrum 'October Glory'
- Acer rubrum 'Autumn Flame'
- Acer freemanii 'Morgan'









WORK HORSE



Acorus gramineus 'Oborozuki'



Panicum virgatum
'Rostrahlbusch'

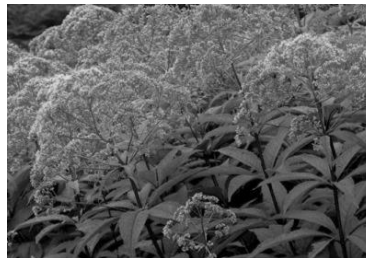


Aronia arbutifolia

SPARK



Lobelia cardinalis
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Eupatorium maculatum
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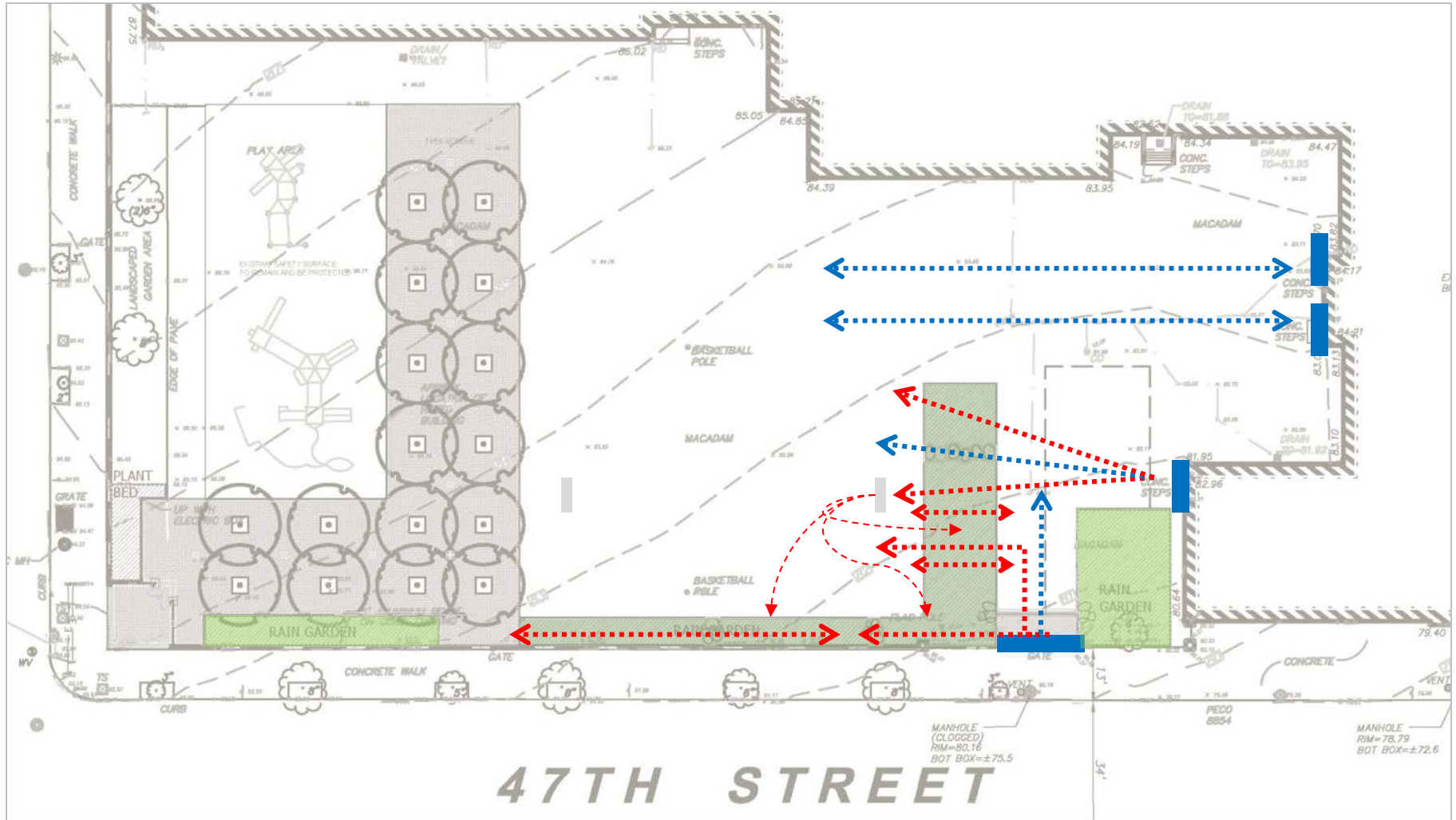
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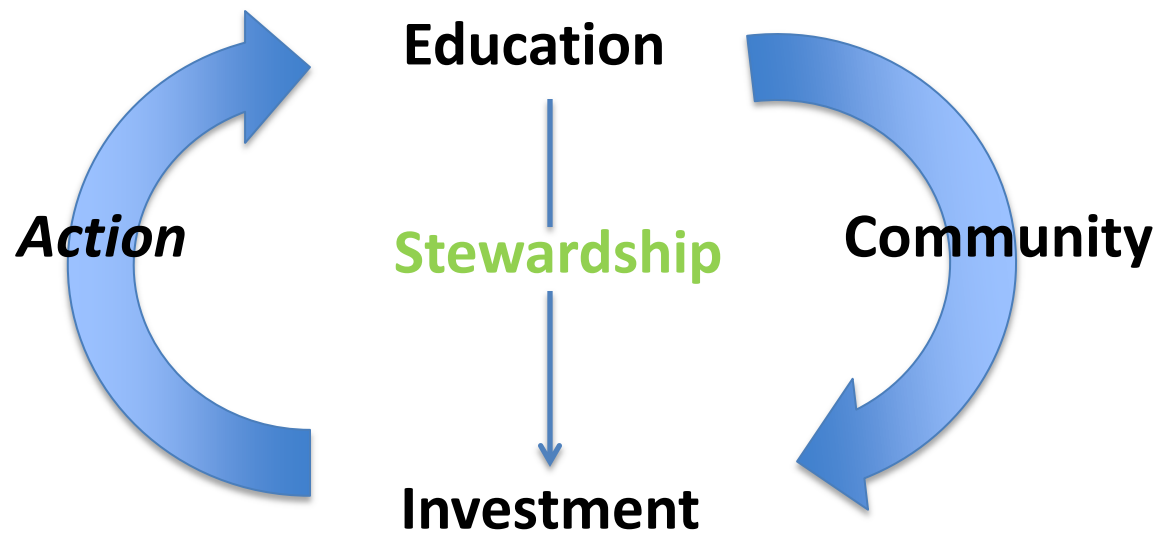
WOULD WE PICK THESE SAME PLANTS AGAIN?



**“Change will lead
to insight far
more often than
insight will lead
to change.”**

LOCATION + PROGRAM = PROBABILITY FOR SUCCESS





COMMUNITY ACTION = PROBABILITY FOR SUCCESS

THE INTENT



NO POST-CONSTRUCTION EDUCATION OR ACTION



LINWOOD PARK – heavy use in the GSI by kids and adults

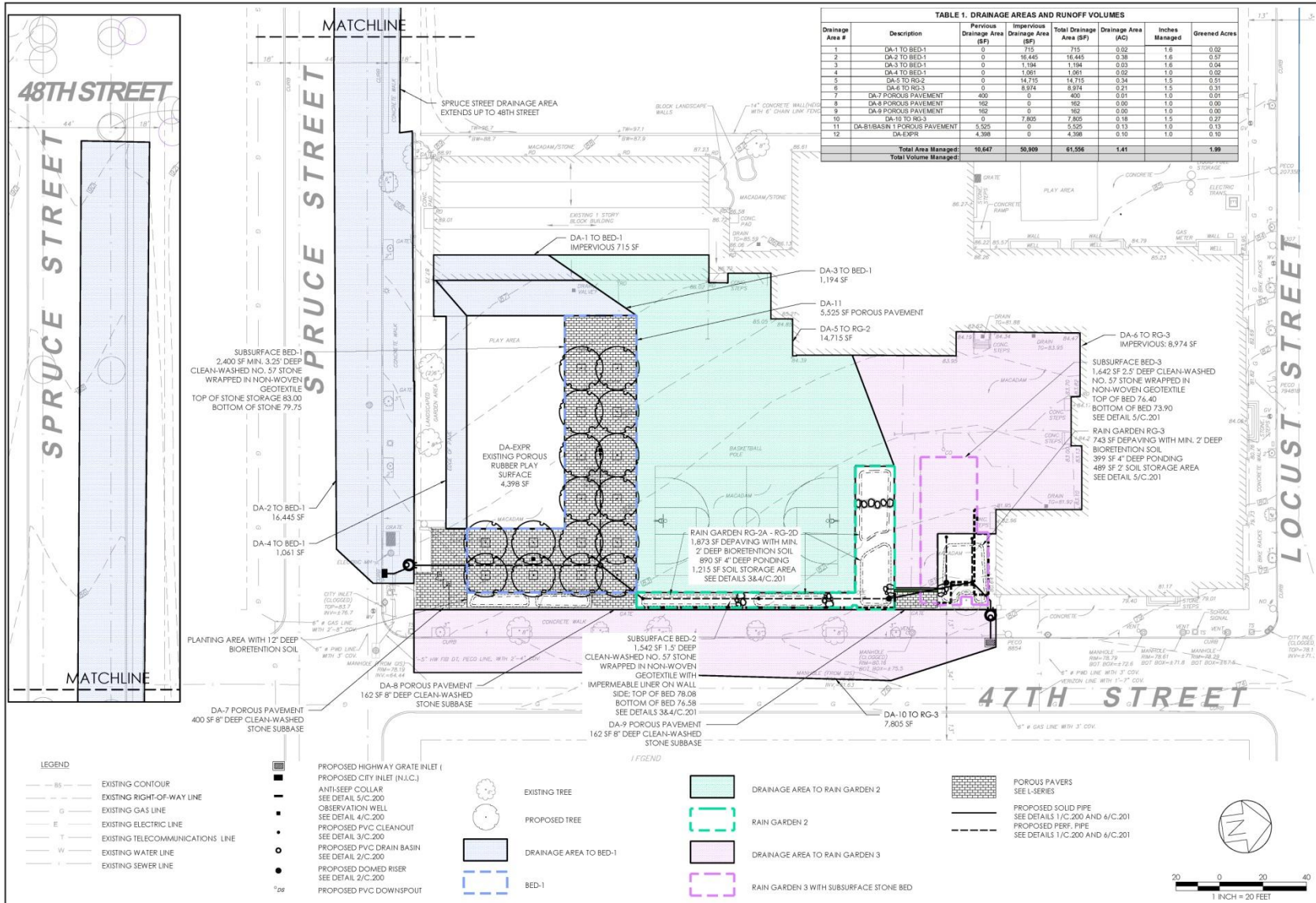


LINWOOD PARK – key is post-construction community involvement and education

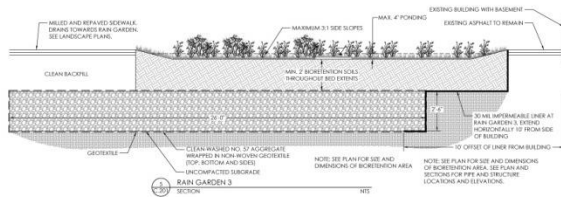


CALCULATING STORMWATER PERFORMANCE





RAIN GARDEN



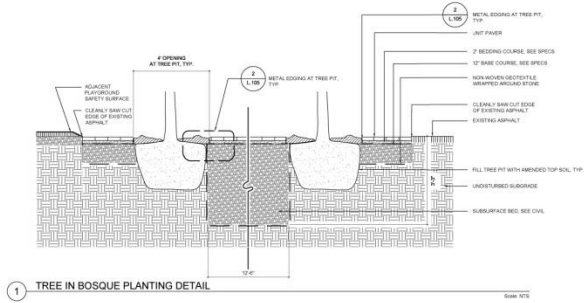
PLANT PERFORMANCE TIED TO SOIL QUALITY AND HEALTH





LEA'S GSI MANAGES
**OVER 58,000 GALLONS OF
STORMWATER RUNOFF**
FOR EVERY INCH OF RAIN
THAT FALLS

TREE BOSQUE





"The humble little plant can function in ways that the stormwater conveyance system cannot."

Heidi Natura, Living Habits



LOCATION + PROGRAM = PROBABILITY FOR SUCCESS



PERFORMANCE METRICS:

- Physical/Visual Health of Plants
- Productivity (bloom)
- Erosion Control
- Health of Soil (microbial presence)



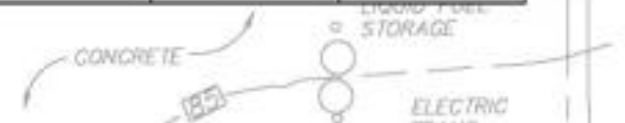
IS IT STILL WORKING?

TABLE 1. DRAINAGE AREAS AND RUNOFF VOLUMES

Drainage Area #	Description	Pervious Drainage Area (SF)	Impervious Drainage Area (SF)	Total Drainage Area (SF)	Drainage Area (AC)	Inches Managed	Greened Acres
1	DA-1 TO BED-1	0	715	715	0.02	1.6	0.02
2	DA-2 TO BED-1	0	16,445	16,445	0.38	1.6	0.57
3	DA-3 TO BED-1	0	1,194	1,194	0.03	1.6	0.04
4	DA-4 TO BED-1	0	1,061	1,061	0.02	1.0	0.02
5	DA-5 TO RG-2	0	14,715	14,715	0.34	1.5	0.51
6	DA-6 TO RG-3	0	8,974	8,974	0.21	1.5	0.31
7	DA-7 POROUS PAVEMENT	400	0	400	0.01	1.0	0.01
8	DA-8 POROUS PAVEMENT	162	0	162	0.00	1.0	0.00
9	DA-9 POROUS PAVEMENT	162	0	162	0.00	1.0	0.00
10	DA-10 TO RG-3	0	7,805	7,805	0.18	1.5	0.27
11	DA-B1/BASIN 1 POROUS PAVEMENT	5,525	0	5,525	0.13	1.0	0.13
12	DA-EXPR	4,398	0	4,398	0.10	1.0	0.10
Total Area Managed:		10,647	50,909	61,556	1.41		1.99
Total Volume Managed:							



PLAY AREA



GSI MAINTENANCE = HEAVY LIFT WITHOUT SUPPORT



GSI MAINTENANCE REQUIRES: PARTNERSHIPS

between Community ↔ Lea School ↔ School District ↔ PWD ↔ UCGreen

CULTURE SHIFT

within the Community , the Lea School and the Philadelphia School District



IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE

1. **Keep the plant palette simple.**
Diversity is great until volunteers can't identify all the diverse plants, and even to professionals they may look like weeds!



IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE



2. Partner with a neighborhood Community Organization for long-term site stewardship. *Without West Philly Coalition for Neighborhood Schools, Lea Greening would not have happened!*

IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE



3. Protect perennials through first 12 months and **until well established**. *Permanent fencing may not be desired or needed, but **the plants need temporary fencing for protection from foot traffic.***

IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE



4. Integrate classroom education **about** the project **into** school curriculum. *Post-construction education and community involvement is essential, otherwise the project remains an orphan.*

IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE



5. **Include Maintenance Budget & Strategy in up-front project costs** – *to cover long-term management as well as maintenance tasks, such as watering, replanting, weeding and external education.*

THE COST OF GOING GREEN (without Maintenance)

Planting



Infrastructure



\$76 per SF



\$479,000

THE REALITY

KEY DECISIONS FOR GSI FUNCTION



1. Increased Loading Ratio for Rain Gardens to keep surface footprint smaller.



2. Maximized porous paving for hard surface to accommodate recreation program & line-up.



3. Changed from monolithic porous paving to porous unit paver to create fundraising opportunities.

KEY DECISIONS FOR LEA SCHOOLYARD DESIGN



INTEGRATING NEIGHBORHOOD CULTURE AND ART TO TELL A STORY

THE INTENT



THE VISION



THE OUTCOME



THE FUTURE LANDSCAPE AMBASSADORS

