

Stormwater Management: One Tree at a Time



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DO TREES MANAGE STORMWATER?



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3 Ways Trees Manage Stormwater

1. Interception
2. Evapotranspiration
3. Infiltration



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Challenges in Urban Areas



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Uncompacted soil is key

1. To grow large trees
2. For bioretention
3. Difficult to achieve in dense urban areas



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Suspended pavement



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Suspended Pavement: Bay Area



Menlo Park – Silva Cell



Sunnyvale – Silva Cell

Castro Valley Blvd – Silva Cell

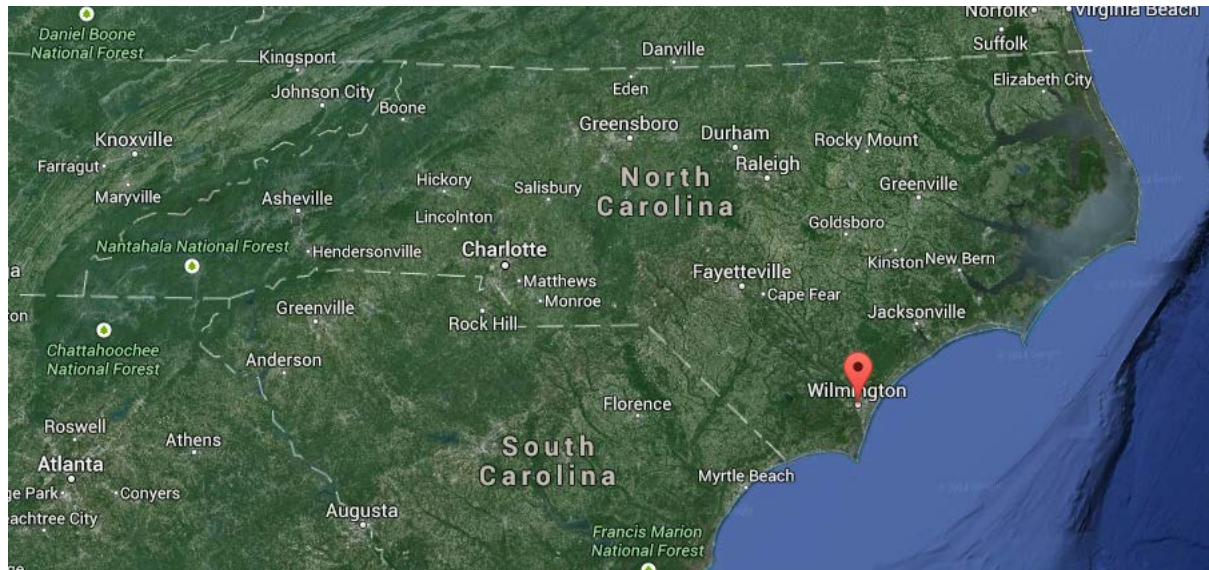


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Case Study: NCSU

Field Monitoring of Two Silva Cell Installations in Wilmington, NC: Final Report
J.L. Page, R.J. Winston, W.F. Hunt III
January 27, 2014



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Case Study: NCSU



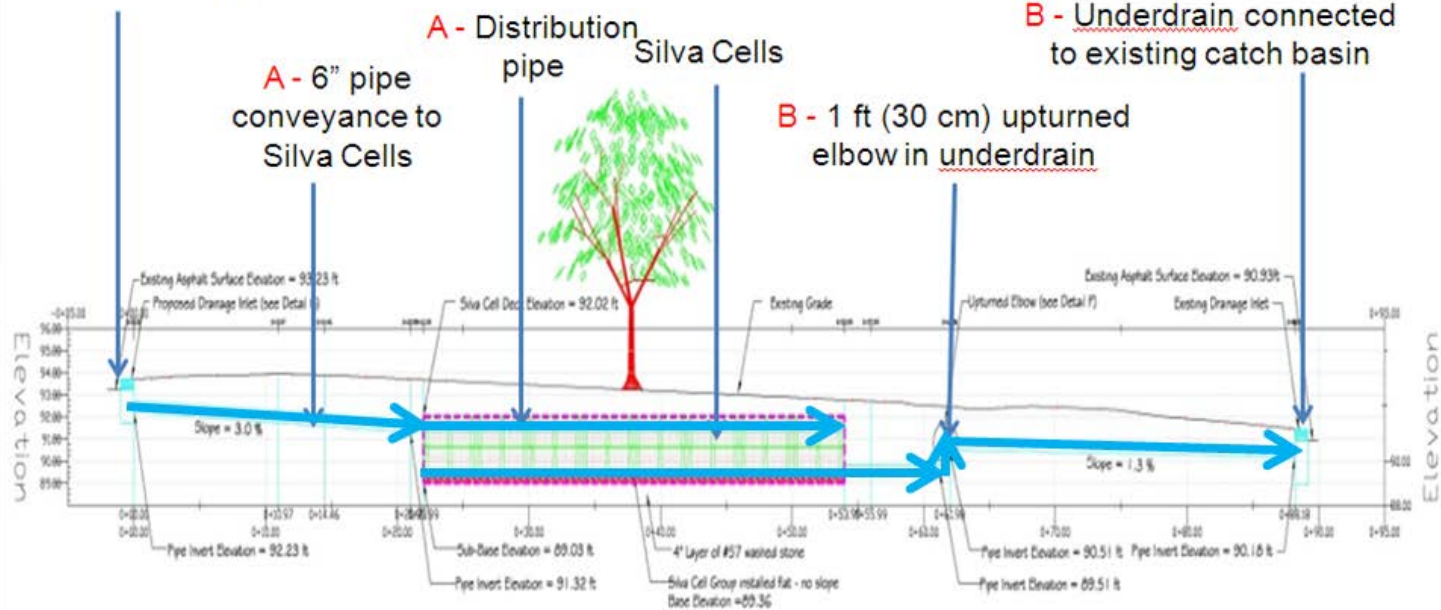
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Case Study: NCSU

Stormwater Routing Cross Section

A - New catch basin with sump along curb line at upslope end of system



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Silva Cell systems performed better or about the same as the mean for bioretention systems in peer reviewed literature for **TSS and heavy metals**.

Unlike some bioretention systems, which leach nutrients, these 2 tree/soil/Silva Cell systems also provided **nutrient removal**.

Maintenance to remove trash, sediment, and leaf litter from the inlet catch basins to the Silva Cell systems is crucial to prevent bypass. Inlet catch basins at these sites were cleaned every 2 months.



Suspended pavement for bioretention

1. Increased Tree Canopy Coverage
2. No net loss of useable real estate
3. Scalable implementation



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Trees and Bioretention

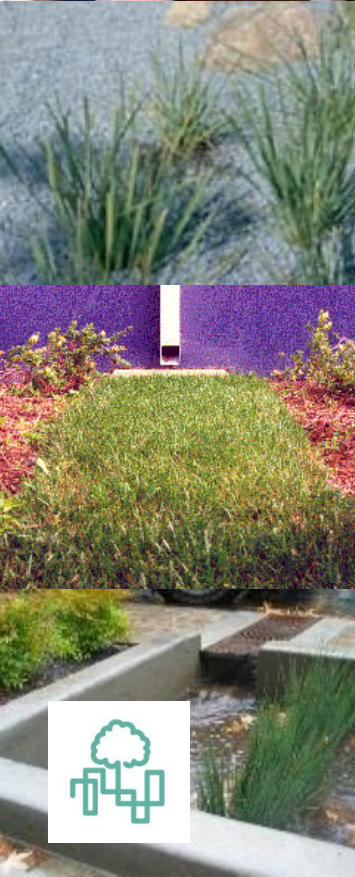


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Challenges/Opportunities

- Drought Challenges
- Maintenance Issues
- Underground bioretention
- Biotreatment Soil Specification
- Tree Species for Stormwater Treatment
- Treatment Train and hybrid designs
- Example of Larger scale implementation
- Green Jobs!



Drought Challenges

- Evaporation vs. Irrigation
- Water Retention vs. Mosquito breeding
- BMP Sizing vs. Soil Volume
- BSM consistency vs. Tree Health

Green Bulb-out



Campbell

Flow-Thru Planter



Alameda

Road Diet: Colma - Before



Before: two travel lanes in each direction, no parking and no cross-walks



Road Diet: Colma, After



After: new bike and parking lanes & green bulb-outs with cross walk.



Retrofit Example Berkeley, Before



Before: City park area - low use with high maintenance



Retrofit Example Berkeley, After



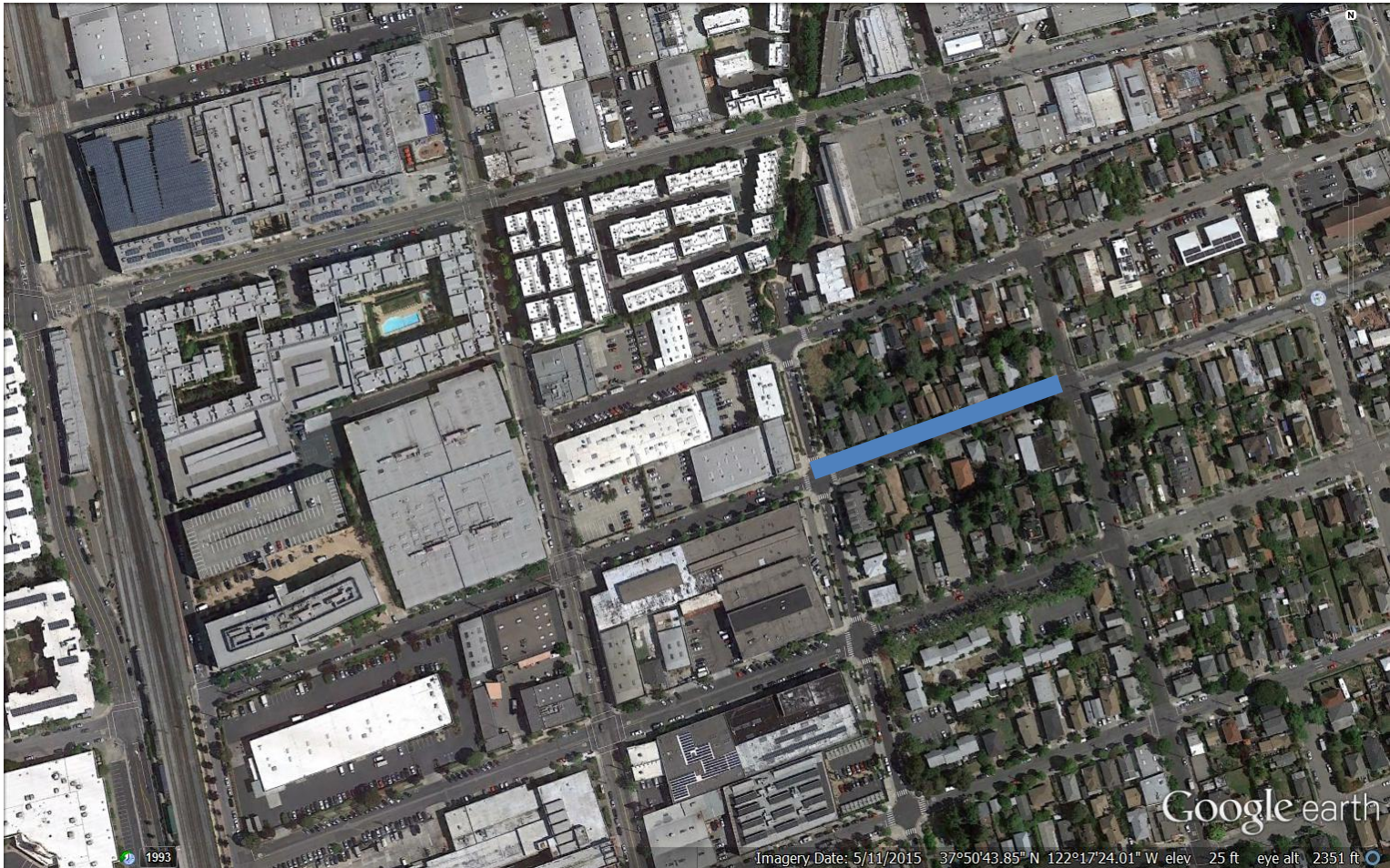
After: re-graded area with new rain garden
treating street run-off



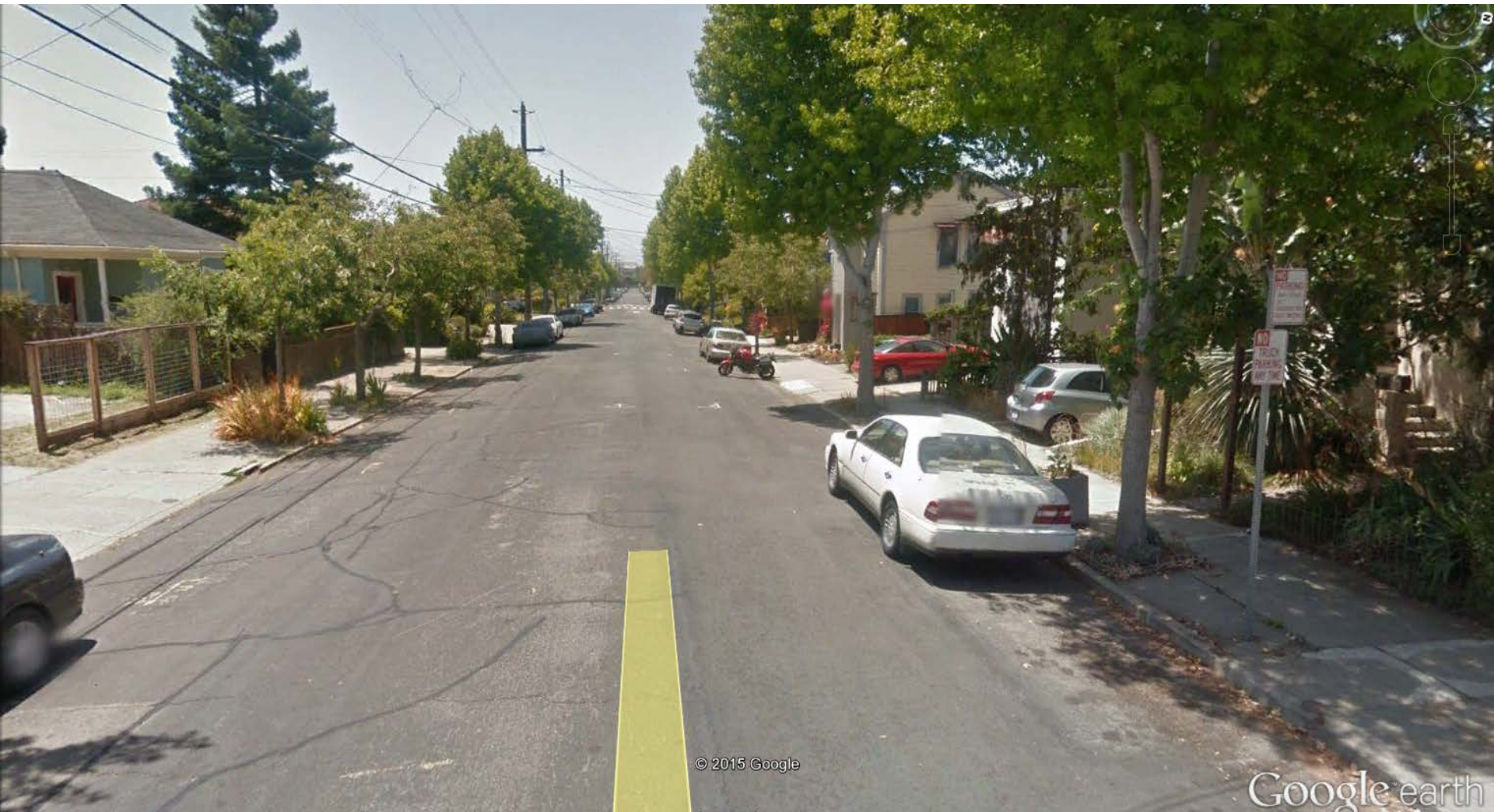
Emeryville: Case Study



Emeryville: 64th Street



Emeryville: 64th Street





Starting with the Tree



- 1,200 cubic feet of soil volume for a large tree
- 4 feet deep planting soil in strip and under sidewalk (with silva cell or other sps product)
- 30 feet tree spacing, 30'x10' or 300 square feet available for surface area per tree
- 300 square feet x 25 (4% rule) = 7,500 sq.ft. catchment area
- Roughly 4 trees needed per block (2 each side)

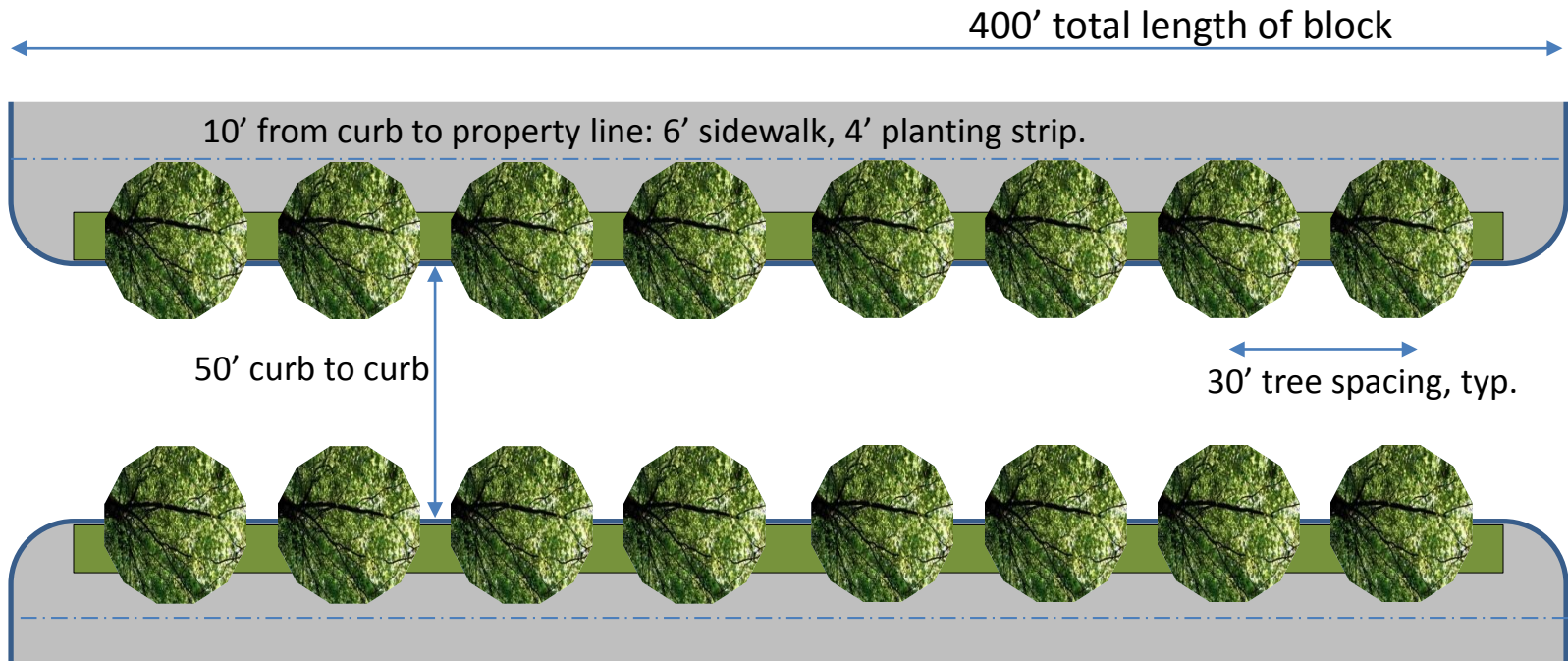


Retrofit with suspended paving

- 400 Foot long Block
- 50 Feet curb to curb
- Street Trees 30 feet on center
- Storm drains at intersections and centerline
- 10 feet from curb to property line
 - 6 foot sidewalk
 - 4 foot planter strip

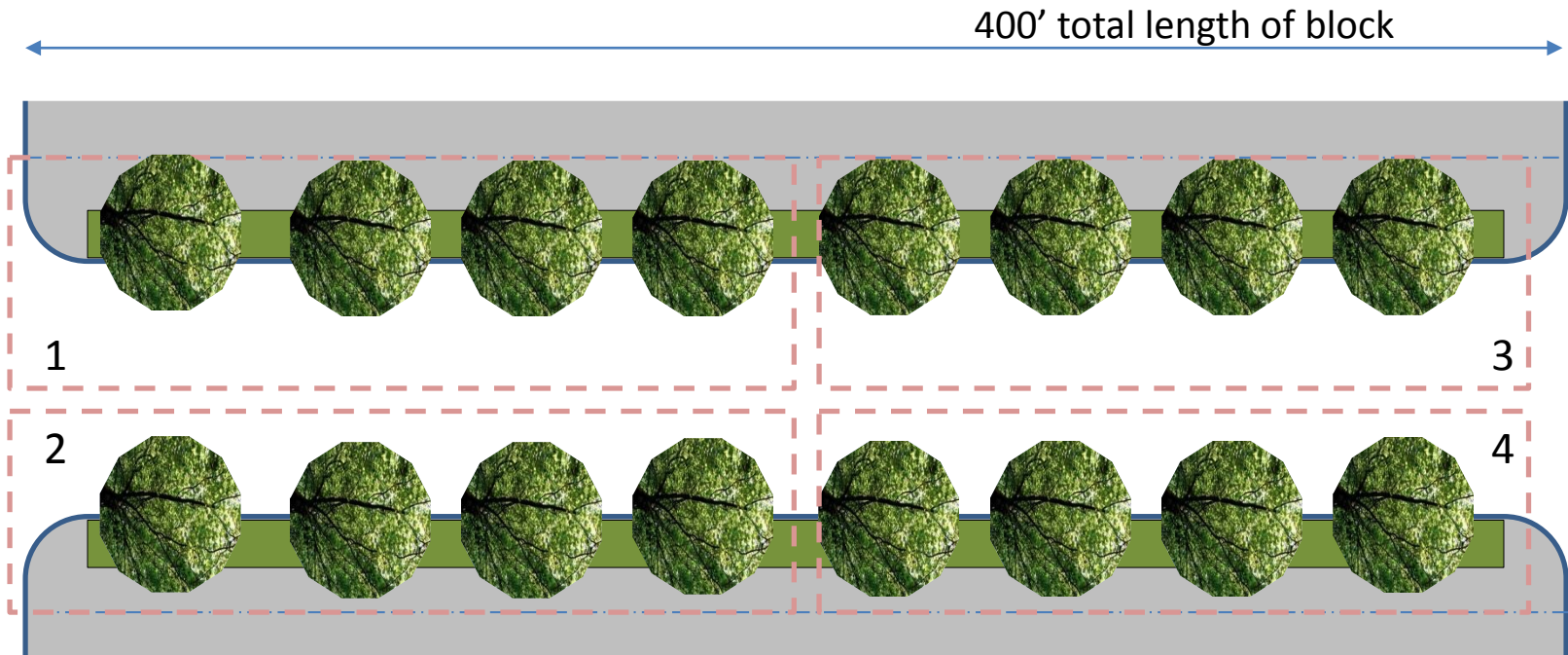


Typical City Street – 400' x 50'



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Suspended Pavement Treatment Watersheds

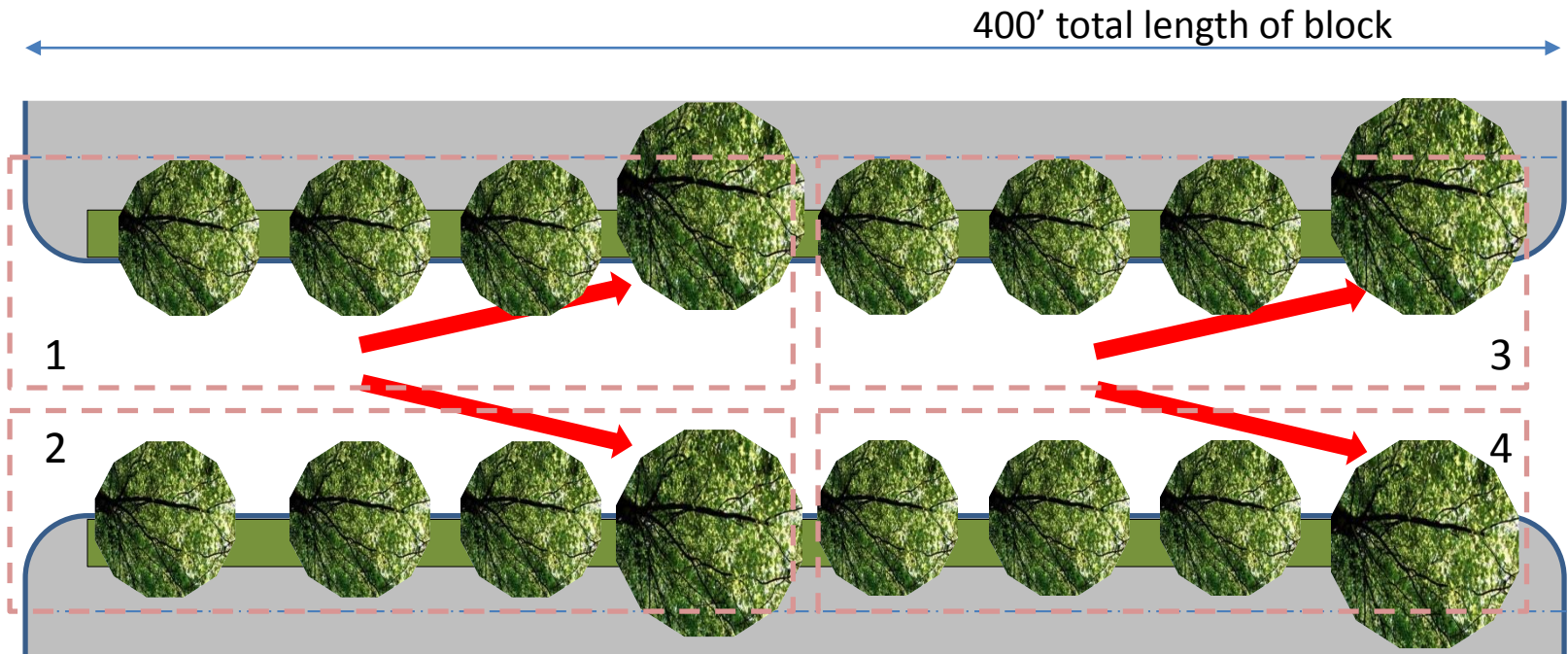


Four unique drainage areas



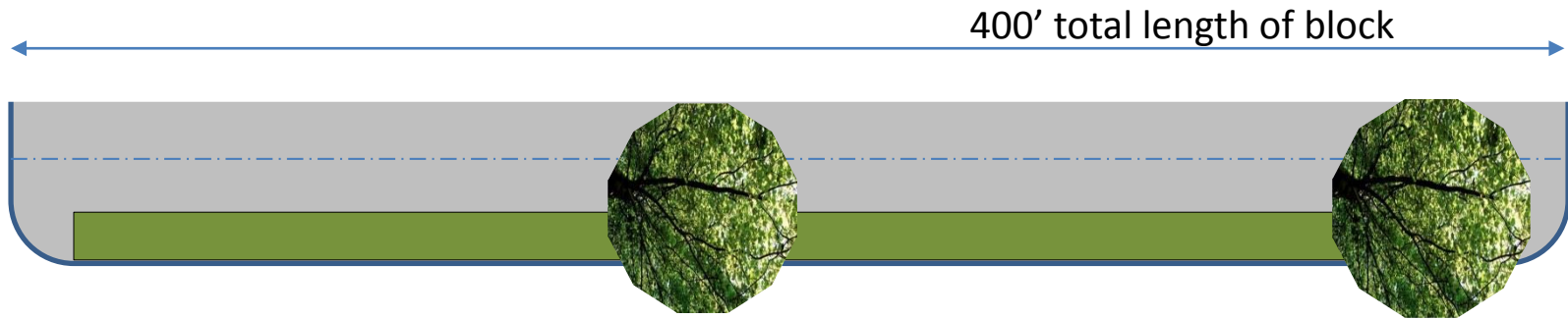
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Four Unique Drainage Areas

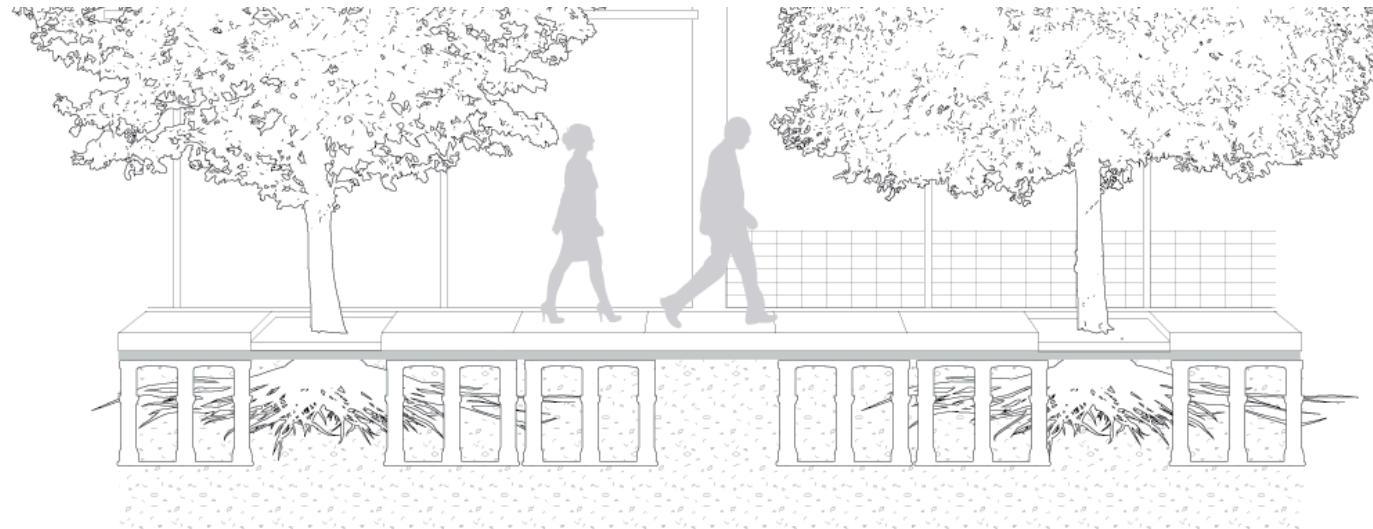


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Suspended Pavement/Treatment Areas



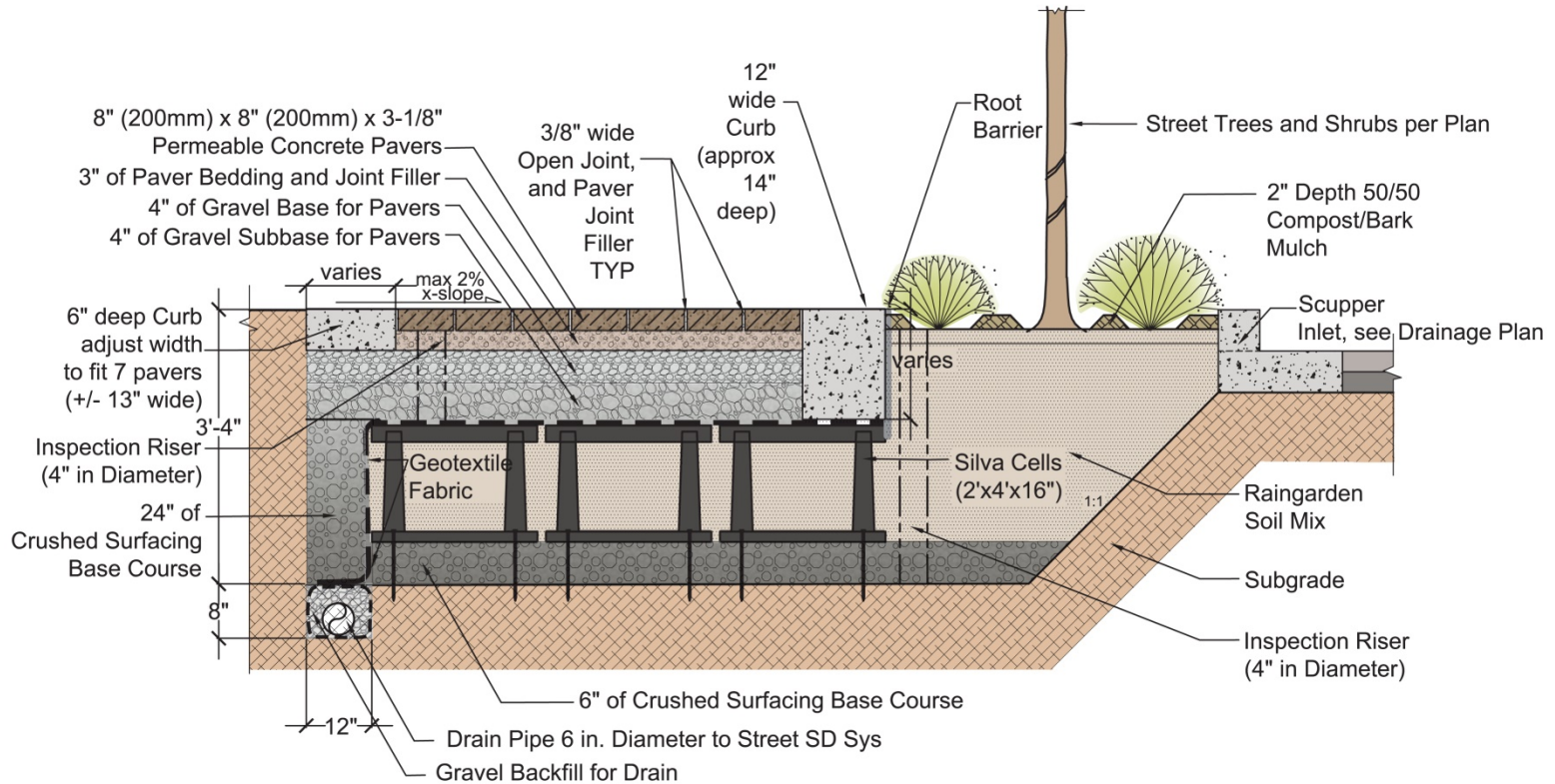
Each of the treatment areas contains 1,200cf of soil for stormwater treatment and tree growth/support.



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Section Detail



SILVA CELL WITH RAINGARDEN AND PERMEABLE PAVERS

NOT TO SCALE



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Cost Analysis

- \$10K per tree installed
- \$5-10 million per square mile
- Could be spread out over 20 years plus
- Green Jobs!

Caveats:

- Flat streets (center crown)
- Minimal utility conflicts
- 10 feet available from curb to property line
- Stormwater system nearby





Contact information

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