



GREEN INFRASTRUCTURE WITH **DEEPROOT SILVA CELLS**[®] IN SAN MARCOS, CA

An Integrated Solution to Manage Stormwater and Promote Healthy Tree Growth





The Project

The City of San Marcos in Southern California has installed 1,200 DeepRoot Silva Cells® at their downtown North City East (NCE) development site - a walkable, urban village for housing, offices, shops, restaurants, and open community spaces.

The Silva Cell project complies with the hydromodification management criteria set out in the National Pollutant Discharge Elimination System (NPDES) permit program for stormwater regulations, and is approved and listed within the County of San Diego Best Management Practice Design Manual (BMP DM) that became effective on January 1st, 2019.

Highlights

- DeepRoot collaborated with our design partner Stevens Cresto Engineering and the City of San Marcos Engineering Division
- Innovative Storm Water Solutions employed through Silva Cell technology where runoff from the public streets at North City East is treated using median and curbside biofiltration facilities that incorporate underground detention modules for pollutant control, hydromodification, and 100-year peak flow migration.
- Silva Cells captured over 80,000 gallons of stormwater from the streets and sidewalks while supporting load bearing surfaces above.
- In addition to the 80,000 gallons of stormwater captured, the North City East project involved planting over 80 trees with underground bioretention offered by over 1,200 Silva Cells.

“The innovative design of the DeepRoot Silva Cell solution aesthetically integrates in the streetscape design, while maximizing land use efficiency and achieving full stormwater compliance”.

Bryan Hill, Senior Engineer, Stevens Cresto Engineering

DeepRoot Silva Cells

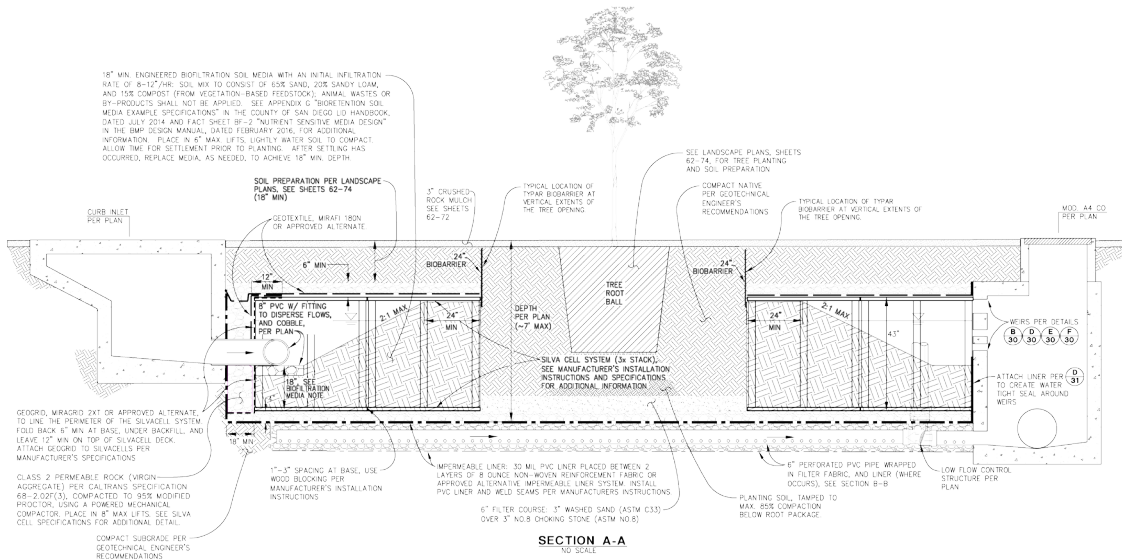
The DeepRoot Silva Cell is a modular suspended pavement system that integrates water, soil and tree roots and delivers on-site stormwater management through bio-retention.

North City East required 80 trees to be installed using 1,200 Silva Cells with the first installation in 2016. The public streets have been designed to incorporate inlet and storm drain designs that collect runoff from the asphalt, sidewalks and adjacent community areas.



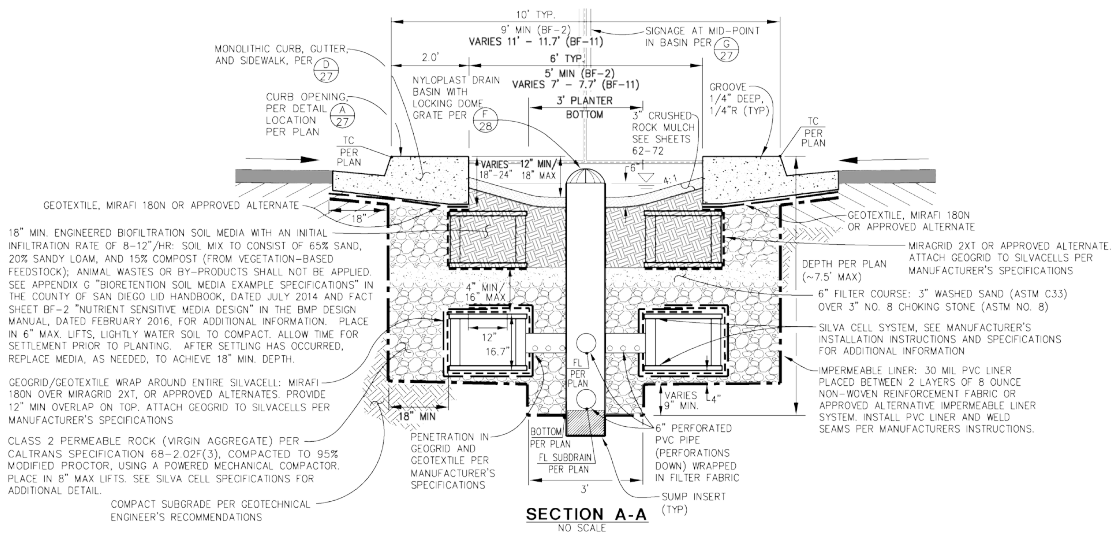
Curbside Underground Biofiltration System

The climate in San Marcos is classified as a Mediterranean climate with more tropical storms than anywhere else in California. During small storm events (85th percentile), runoff enters the curb inlet and is discharged to the voids within the Silva Cells. Water ponds up to six inches and percolates through the engineered biofiltration soil media (with initial infiltration rate of 8 to 12 inches/hour. Soil mix consisted of 65% sand, 20% sandy loam, and 15% compost) to the subdrain system before discharging out of the control structure. During larger storms, runoff entering the curb inlet ponds up to the highest weir and is detained behind the staged outlet. Runoff discharges directly from both the orifice openings in the control structure and percolates through the media to the subdrain system, before discharging out of the control structure.

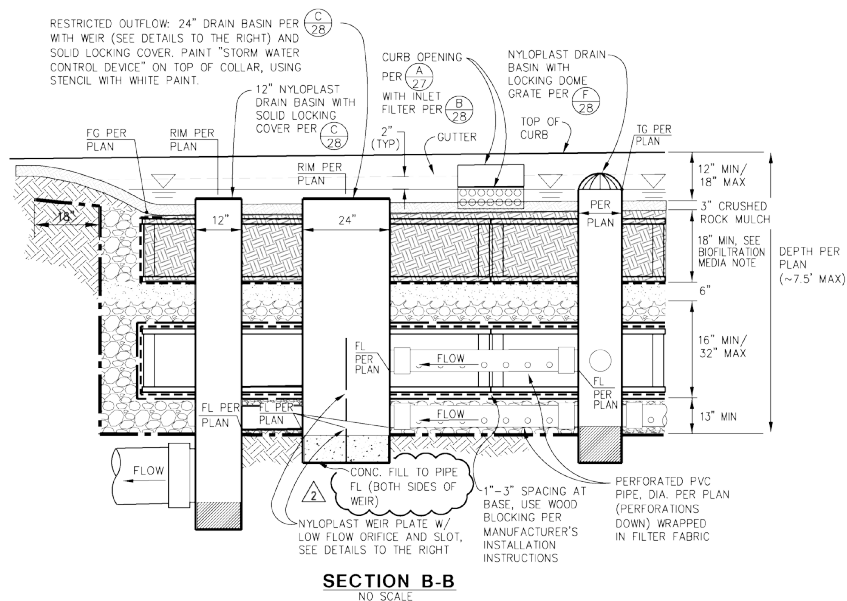


Median Biofiltration System

During a low flow event (85th percentile rainfall event), the runoff enters the biofiltration system through curb openings, ponds up to six inches in the biofiltration, percolates through the media and into the subdrain system, and then discharges out the control structure.



In the event of stronger storms, first-flush runoff ponds up to six inches and then enters the system through a catch basin which is connected to the subdrain and pipe system. The discharge flows into the voids within the rows of Silva Cells situated in the rock column below the planting media. Both pipe systems discharge to the control structure and runoff is released into the municipal storm drain system as a controlled rate, therefore providing peak flow reduction.



Environmental Impact

The installation of the DeepRoot Silva Cell technology directly impacts and is approved by the California Regional Water Quality Control Board, and the Carlsbad Watershed Management Plan (WMA). The system directly supports the requirements set out by the WMA to manage urban runoff, pollutant abatement, and stormwater management.

DeepRoot provided North City East with a stormwater solution to guarantee runoff from the public streets is treated using median and curbside biofiltration.



“North City East has successfully implemented a solution that delivers pollutant control, hydromodification, and 100-year peak flow mitigation using the DeepRoot Silva Cell Solution”.

Bryan Hill, Senior Engineer, Stevens Cresto Engineering



About DeepRoot

DeepRoot Green Infrastructure develops solutions to enhance urban forests and surrounding watersheds in city streets, parking lots, campuses, and other heavily-paved areas. Silva Cell, our flagship product, is an underground framework for containing lightly compacted soil that supports large trees and absorbs runoff from rain, increasing air and water quality, reducing energy loads, mitigating heat island effect, and nurturing trees for a long life in their communities. Headquartered in San Francisco with locations in Vancouver and London, DeepRoot has more than forty years of experience helping trees thrive in cities, nurturing over 500 blocks of urban treescape in the built environment around the world.

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