

UNDERGROUND BIORETENTION ALONG ARMORLITE DRIVE

Integrated trees and stormwater project breathes new life into
formerly industrial stretch in San Marcos



Designers at KTU + A Planning + Landscape Architecture along with RBF Consulting, Carlsbad, specified Silva Cells in order to support the weight of the sidewalk pavement while also providing adequate soil volume beneath the paving for live oak, Brisbane box, and crape myrtle trees. Silva Cells also serve a stormwater management function at Armorlite Drive, acting as an underground raingarden/bioretention and allowing stormwater to be filtered by the soil in the silva cell system and managed onsite. In all, 8,800 cubic feet of soil was installed under the paving to support 52 new trees and to manage the street's stormwater.

On the south side of Armorlite Drive, a 24" precast grate inlet catch basin captures water for inflow to the silva cell system via a 4" perforated PVC pipe that distributes water throughout the system while, a 4" perforated PVC pipe functions as the underdrain within a 12" class 2 permeable base.

The system minimized infrastructure and maintenance costs while allowing runoff to filter through the soil, where it can be cleaned and cooled before entering the City's storm sewer or the nearby San Marcos Creek. The system is designed to be

San Marcos, a small city in the North County region of San Diego County, now stands out as a distinct, regionally identifiable city with its own light rail public transit system and is home to several colleges and universities. Recently they've focused attention and resources on retrofitting select parts of the city to make them more pedestrian and cyclist friendly, especially in areas close to transportation and education hubs, such as those surrounding light-rail sprinter stations and close to local colleges and universities.

Armorlite Drive, a strip of heavily trafficked road about a third of a mile long just north of state Route 78, was recently targeted by the city as a location for a total road overhaul to create a more complete street. The project introduced raised 8-foot-wide bike lanes, 10-foot-wide sidewalks for outdoor cafes and dining, bike racks, angled and parallel parking spaces, street trees, and other green landscape enhancements to the street. Stormwater management was a major focus of the project.



able to handle a 100-year rain event (121mm/24 hours) and manages water quality, peak, and volume.

“We used Silva Cells as a stormwater quality BMP (best management practice) in order to comply with the Regional Water Quality Control Board storm drain requirements and to provide pollutant-control and flow-control functions. The best way to achieve this is through biofiltration, which is usually done with a bioretention area at the ground surface. With a roadway project like this, the surface area to do bioretention is hard to find. So the underground Silva Cells were the perfect solution,” says David Wiener of Michael Baker International, the engineering, planning, and consulting firm on the project.

He continued, “we considered permeable pavement, bioretention areas, and proprietary filtration devices. Silva cells made the most sense because they provide all the stormwater benefit that we need, don’t take up surface area, and are great for the proposed trees.”

In 2017, the Armorlite Drive Smart Growth Improvement Project was selected for an Outstanding award from the American Public Works Association.

Once a nondescript street lined by warehouses and empty lots, Armorlite Drive has undergone a complete transformation and is now a more livable, green, pedestrian-friendly environment that plays host to a variety of upscale apartments and commercial spaces.

Installation Summary:

Average soil volume per tree: 169.23 ft³ (4.79 m³)

Number of Trees: 52

Total Silva Cells: 880 Frames, 440 Decks

Installation Date: 2015

Installation type: Integrated – Trees and Stormwater

Project Site: Institutional

Project Designer: KTU+A Planning & Landscape Architecture

Contractors: Tri-Group Construction

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