Green Infrastructure & Stormwater Management CASE STUDY

The La Jolla Shores Area of Special Biological Significance (ASBS) Dry Weather Flow and Pollution Control Program

Location: University of California, San Diego
Client: University of California, San Diego
Design Firm(s): KTU&A, Nasland Engineering, and Mactec Engineering
Landscape architect/Project contact: Mark Carpenter from KTU&A and Kimberly O'Connell from UCSD
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ASLA Chapter: Southern California

Project Specifications

Project Description: The University of California, San Diego (UCSD) installed innovative storm water treatment controls at Scripps Institution of Oceanography (SIO) to eliminate non-storm water discharges, reduce the loading of pollutants in storm water run-off, improve water quality, and protect valuable ocean resources within the Area of Special Biological Significance adjacent to La Jolla Shores. These include four ecology embankment media filter systems that use natural processes to prevent low flows from reaching the ocean and remove pollutants from runoff before it reaches the beach. These treatment systems do not require mechanical equipment or energy making them ideal for developed coastal areas where space is limited. In addition, a rain barrel system was installed as a demonstration project to show the public how roof run-off could be collected and used.

Project Type:
Institutional/Education
A retrofit of an existing property

Design features: Bioretention facility, rain garden, bioswale, rain barrels, and curb cuts.

This project was designed to meet the following specific requirements or mandates:
State statute, to meet funding criteria. The project supports the objectives of the California Ocean Plan to prevent the discharge of dry weather flows and stormwater pollutants into the ocean.

Impervious area managed: greater than 5 acres

Amount of existing green space/open space conserved or preserved for managing stormwater on site: 5,000 sq/ft to 1 acre. As a retrofit project, the ecology embankment media filters are designed to manage storm water on the undeveloped slope above the beach. The landscape slopes ranged from 1:2.5 to 1-1.5, creating a challenging environment for implementing a BMP with a stated maximum slope of 1:4.

The regulatory environment and regulator was supportive of the project.

Did the client request that other factors be considered, such as energy savings, usable green space, or property value enhancements? The ecology embankment media filters use natural processes (aggregate blend of crushed rock amended with dolomite, gypsum, and perlite) to remove pollutants such as sediment, heavy metals, and bacteria from storm water run-off and native vegetation for evaporation-transpiration of water. The system requires no energy or mechanical treatment. This passive design is very cost effective and requires very little maintenance in comparison to mechanical filtration systems.

Cost & Jobs Analysis

Estimated Cost of Stormwater Project: $ 500,000-$1,000,000 (Public funding: Federal, state, local - the project was funded by the American Recovery and Reinvestment Act (ARRA) through the State Water Resources Control Board, the Miocean Foundation, and the University of California, San Diego)

Was a green vs. grey cost analysis performed? Yes. Numerous green and traditional site design approaches were analyzed. The green approach was selected based on the anticipated effectiveness at protecting the designated Area of Special Biological Significance (ASBS) off shore of UC San Diego and addressing the pollutants of concern as identified through site inspections and water quality testing, as well as site constraints.

Cost impact of conserving green/open space to the overall costs of the site design/development project: Conserving green space did not increase the overall costs of the site design. Traditional site design approaches were not desirable for this project because it is located in a highly developed area and it would have resulted in substantial rerouting of utilities, disruption of high-use areas, as well as degrading the visual beauty of an important protected coastline.

Cost impact of conserving green/open space for stormwater management over traditional site design/site development approaches (grey infrastructure)? Slightly reduced costs (1-9% savings). The ecology embankment media filters use natural processes (rock blend and native vegetation) to treat run-off. The system design requires no energy or mechanical treatment. This passive storm water treatment design is very cost effective and needs very little maintenance. The ecology embankment media filters were designed based on

storm drain system configuration constraints to minimize the cost associated with re-design/re-routing of the system.

Number of jobs created: 17 per quarter

Job hours devoted to project:

Planning and Design: 500 hours
Construction: 8,515 hours
Annual Maintenance: 40 hours

Performance Measures

Stormwater reduction performance analysis:

The four ecology embankment media filters are designed to treat the 85% storm event for heavy metals, total suspended solids, and bacteria and infiltrate and treat dry weather flows. The media filters provide some detention benefits based of adhesion/cohesion properties of water as it flows through the gravel media, especially with regard to dry weather flows. The media filters are designed to prevent non-storm water runoff from reaching the beach and are a flow-through system for storm water, removing pollutants before it discharges onto the beach. Pollutant Removal based on effectiveness monitoring to date (additional constituent data available): 85% reduction of fecal coliform 40% reduction of total suspended solids 25% reduction of copper.

Community & economic benefits that have resulted from the project: This project has many components that help to protect and preserve the sensitive nature of the shoreline and adjacent areas so the public can enjoy it for years to come. Some of the most visible components of the project include four media filters, a rain barrel system, a meandering sidewalk in front of the Scripps Seaside Forum, and multiple landscape areas that help to minimize sediment and dry weather run-off. The ocean views along the Scripps Institution of Oceanography are enhanced for all visitors of the La Jolla Shores. This project has resulted in cultivating a more vibrant, pedestrian-friendly environment consistent with the goals of the California Coast Commission, La Jolla Shores Association, and La Jolla Community Planning Association.

Project Recognition

Affiliated Professional Awards (e.g. APA Planning Award) - American Public Works Association Award, American Society of Civil Engineers ASCE Outstanding Award in Water Quality, Flood Control, and Drainage Facilities as part of our Civil Engineering Project Awards Program

Additional Information

An Ecology Embankment is an innovative linear, flow-through storm water treatment BMP that was developed by the Washington State Department of Transportation for treatment of runoff

along highway side slopes. The Ecology Embankment implementation at UCSD was modified from the road-side conditions it was originally designed for to act as an end-of-pipe treatment control within the land constrained SIO campus. The Ecology Embankment has four components: a gravel no-vegetation zone; a vegetated filter strip; the ecology bed mix; and a gravel-filled, under-drain trench. The gravel no-vegetation zone provides physical straining and a reduction in the velocity of the storm water entering the system. Stormwater pools in the gravel no-vegetation zone and discharges as sheet flow across the vegetated filter strip. The vegetated filter strip provides physical straining and biofiltration for storm water prior to discharging into the ecology bed mix. The ecology bed mix contains crushed rock, dolomite, gypsum, and perlite. The ecology bed mix treats storm water by physical filtration, chemical precipitation, sorption and cat ion exchange, and biological uptake and metabolism. The gravel-filled, under-drain trench collects the treated stormwater and diverts it to the outfall stormwater conveyance system.