Green Infrastructure & Stormwater Management CASE STUDY

Extended Wetland Multi-Cell Stormwater Facility for Low Impact Development

Location: Woodinville, WA
Client: Redhook (now Craft Brewing Alliance)
Design Firm(s): RG Satterwhite, AIA, Architect; Huitt-Zollars (formerly RCA, LTD.) Landscape Architects & Civil Engineers
Landscape architect/Project contact: Matt Mathes, ASLA
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ASLA Chapter: Washington

Project Specifications

Project Description: The 2.5-acre extended wetland multi-cell retention detention facility is based on a prototype design developed by T.R. Schueler. The Redhook stormwater facility is part of a sub basin system with the subject site lying at the lowest point of a 145-acre sub basin, including the 24-acre industrial site. In 1992, the design was a result of a multi-discipline team effort led by the landscape architect to create a system of bioswales, a primary storm pond (approximately 30,000 sq/ft) plus the 2.5-acre pond with primary bay and several cells separated by a series of ridges in the pond bottom, interconencted with balance pipes for maximizing contact time within the pond facility prior to controlled release to the Sammamish River at pre-development runoff rates.

Project Type:
Industrial
Part of a new development

Design features: Bioretention facility, bioswale, downspout removal, and porous pavers. The extended wetland multi-cell storm water pond (2.5-acres) in an interconnected train of swales and ponds is an excellent low impact development local example in operation for more than 15 years.

This project was designed to meet the following specific requirements or mandates:
State statute, county ordinance, local ordinance, developer/client preference, prototype published pond design by Tom Schuler

Impervious area managed: greater than 5 acres

Amount of existing green space/open space conserved or preserved for managing stormwater on site: greater than 5 acres. The developed portion of the 24-acre site was very limited. The remaining wooded portion of the site of approximately 11 acres was placed into permanent open space category, including stream buffers, wetlands, wetland buffers and the stormwater facility, all protected by RCW 84.34 Public Benefit Rating System program.

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? Yes, some of the additional study was client requested and some was initiated by consultant team. Design control was largely dictated by King County Surface Water Design Manual (1991 edition) and local regulations. Green space retention was regulated by King County and City codes to preserve wetlands and buffers. Shoreline regulations required enhancement of buffer areas, including placing the 2.5-acre prototype stormwater facility in the shoreline buffer. Water conservation studies explored using the stormwater pond to discharge brewery operation waste water, but local agencies refused to consider this option. Pretreatment of brew waste water was analyzed, yet Metro sewer agency was unable to relieve the fees generated from handling waste water to approve a higher use of the 2.5-acre storm water pond at the time (1992 -1995). The stormwater pond as a mutli-use site amenity enhancement helps make the Redhook Woodinville site setting one of the top visitor attractions in the Seattle region.

Cost & Jobs Analysis

Estimated Cost of Stormwater Project: $50,000-$100,000 (Public funding: None - 100% private investment by publically traded corporation (private company at start of project, went public during construction))

Related Information: Detailed cost information for the storm water system is available from the project Technical Information Report prepared in 1991 & 1992, and on file at King County DDES and also at City of Woodinville, WA.

Was a green vs. grey cost analysis performed? Yes, basic comparison was made for covered vaults and tanks placed under parking areas served by piped convenyance to the open pond concept served primarily by collection swales. Conventional "box cut" rectangular shaped stormwater ponds using adopted standards (circa 1991-1992) were compared to the extended wetland multi-cell concept relying on emergant wetland plants (primarily Juncus species), as the greenest stormwater design solution with the lowest life cycle maintenence costs. The pond features a circular shape contoured to fit the site and minimize tree removal within the shoreline stream buffer area.

Cost impact of conserving green/open space to the overall costs of the site design/development project: Conserving 11 acres on site reduced development intensity and site construction costs. The site was orginally slated for development of a higher intensity of industrial development. The craft brewing concept (microbrewery) emerged as a business model with higher value added prospects that enabled a lower intensity (approximately 125,000sq/ft compared to 250,000 sq/ft of building coverage). The design featured the stormwater facility (2.5 acres) as a multi-use site element, rather than a feature dedicated to only stormwater use. The storm pond is a natural visual feature from the restaurant deck during seasonal outdoor dining. A ropes course was added above the pond for active, competitive supervised recreation by primarily young adults. Conserving open space was also part of the property tax reduction strategy by Redhook (lowered the overall 24-acre property assessment) made possible by a compact site layout that also minimizing site development costs.

Cost impact of conserving green/open space for stormwater management over traditional site design/site development approaches (grey infrastructure)? Significantly reduced costs (10% or greater savings). Traditional stormwater facility deisgn to adopted standards would have been 15% more expensive to develop and 10% more expensive to maintain. Elements of standard design required include fencing (eliminated by using flatter, safe slopes), and piped conveyance (elimiated by use of bioswales to connect ponds and a 2 pond concept). Elements of standard design maintenance were avoided costs of sediment removal from pond (mitigated by plantings in pond) and avoided cost of pipe maintenence and pipe replacement (eliminated by bioswales).

Number of jobs created: 25 (facility operation staff)

Job hours devoted to project:

Planning and Design: 300 (storm water site design & permitting only)
Construction: 300 (estimated for the storm water system only)
Annual Maintenance: Not Available
Other: 250 hours - permitting from several agencies

Performance Measures

Stormwater reduction performance analysis:

The design performance data is available in the Technical Information Report (TIR) on file with King County DDES permit agency and City of Woodinville, WA building department. Generally, the site was designed to match pre-development rates of storm water discharge off-site after site development of approximately 45% of the 24-acre site, plus mitigation of upstream sub basin pass-thru runoff flows without full stormwater controls for the remainder of 145-acre sub basin lying uphill. The design met 10-year, 24 hour and 100-year, 24 hour thresholds, plus mitigation capacity for 100-year flood storage within the 100-year flood plain.

Community & economic benefits that have resulted from the project: Direct benefits include formation of the Woodinville Tourist District including the subject 24-acre site and surrunding area, primarily new wineries, restaurants and hotels developed since this $24 million Redhook project. Property values have increased significantly since project completion in early 1990's and have not taken as deep a dip in value, compared to the national, regional and local trends since fall, 2008. The "green" stormwater site design approach by Redhook Woodinville became a local forerunner of the national and Puget Sound region sustainable design trends now codified at the federal, state, regional and local levels for similar low impact development storm water solutions.

Project Recognition

1998 Award of Excellence Association of Builders and Contractors Western Washington

Additional Information

Links to images: Example of extended storm water pond prototype: http://vwrrc.vt.edu/swc/NonPBMPSpecsMarch11/DCR%20BMP%20Spec%20No%2015_EXT%20DETENTION%20POND_Final%20Draft_v1-9_03012011.pdf Photos of the Redhook Woodinville project:

Project Credits: Redhook Brewery - Founder, Paul Shipman, General Manager David Mickleson SeaCon, LLC - Contractors and Construction Management R.G. "Skip" Satterwhite, AIA - Project Architect GeoEngineers, Inc. - Geotechnical Engineering RCA, LTD - Landscape architects, Civil Engineers, Surveyors & Permit Assistance for Site Package