Wattles Boys and Girls Club

9330 SE Harold Street, Portland

Project Summary

Project in Brief

Project Type:	Commercial stormwater retrofit (as part of an expansion and renovation project)
Technologies:	Landscape infiltration basin; infiltration planter; sand filter/infiltration gallery
Major Benefits:	• Runoff from more than 21,000 sq. ft. of roof was removed from the combined sewer. • The stormwater facilities remove more than 314,000 gallons of runoff from the sewer in a typical rain year, with corresponding reductions in runoff pollutants. • The project added 4,800 sq. ft. of native landscaping, improving the urban environment and the aesthetic appeal of the property.
Cost:	$56,581 (unit cost of $2.60 per sq. ft. of impervious area managed). The cost includes some landscaping that was not essential to the goal of removing stormwater from the sewer system. Environmental Services provided a $30,000 grant for the project.
Constructed:	Fall 2001

Project Background

The directors of the Boys and Girls Club were finishing plans for an expansion and renovation project in 2001 when they received information about the Willamette Stormwater Control Program[1]. The directors viewed a stormwater project as an opportunity to improve the appearance and surroundings of the heavily-used building, to help reduce combined sewer overflows (CSOs) to the Willamette River, and to provide valuable educational opportunities for the community. The Club owners also wanted to save money on stormwater utility bills.

The plans for the renovation project originally specified a soakage trench to manage roof runoff from a 3,000 sq. ft. addition to the clubhouse. The designs were subsequently revised to manage roof runoff from the entire building. The Club submitted a grant application in May 2001 and Environmental Services accepted the project into the program.

Aerial view of the Boys & Girls Club in 2002 after completion of the project. North is at the top of the image; the patio planters are visible on the west side of the building and the landscape infiltration basins are visible on the south side (circled in red)

[1] Environmental Service implemented the Willamette Stormwater Control Program in 2001. The Program offered financial grants and technical support for a series of projects to retrofit existing commercial properties with stormwater controls incorporating green technologies. The Program recruited these demonstration projects in order to research the feasibility, cost and performance of commercial stormwater retrofits in the area served by the combined sewer. The Program provided grant funds for eleven projects. The projects were completed by July 1, 2003.

Project Scope

- Redirected runoff from over 21,000 sq. ft. of roof to a series of stormwater infiltration facilities.
- Constructed three landscape infiltration basins and a subsurface sand filter/infiltration gallery.
- Constructed two stormwater infiltration planters and a concrete drainage flume.
- Disconnected several downspouts and installed subsurface downspout extensions.
- Installed two small drywells.

Entrance at NW corner; note tip of large patio planter next to flag pole; spring 2003

Notable features

- Educational value: the stormwater planters, roof scupper, and concrete flume visually enhance the building entrance and provide educational opportunities for children visiting the club.
- Stormwater capacity: the addition of small drywells increased the capacity of two stormwater facilities - a planter and an infiltration basin.

Large patio planter; note overflow for drywell ("pipe well"); spring 2003

Project Design

Robertson, Merryman, and Barnes, a local architecture firm, designed the stormwater project as part of the expansion and renovation project. The project triggered the requirements of Portland's Stormwater Management Manual because the expansion added more than 500 sq. ft. of impervious surface.

The stormwater management goal was to provide complete on-site disposal of roof runoff from the clubhouse and gym, maximizing the use of surface landscape facilities within the space constraints of the site.

<u>Overview of the Stormwater System</u>

- A total of 3,500 sq. ft. of roof drains to two infiltration planters near the entrance; one overflows to a small drywell within the planter and the second overflows through a sculpted concrete trench ("flume") to linked landscaped infiltration basins.
- There are three landscape infiltration basins along the south side of the building.
    - The western infiltration basin receives runoff from the planter near the entrance and from adjacent roof areas. It overflows into the middle basin. The two linked basins receive runoff from a total of 10,300 sq. ft. of roof.

Small patio planter; 2004

- The eastern infiltration basin receives runoff from 2,100 sq. ft. of roof; overflow is directed to a small drywell.

- Runoff from about 7,700 sq. ft. of roof on the north side of the building is piped under the building to a combination sand filter/infiltration gallery, which also acts as an emergency overflow for the linked infiltration basins.

Large patio planter; note overflow for drywell ("pipe well"); spring 2003

Stormwater Capacity and System Components

I. Introduction

The overall design goal was to meet Bureau of Development Services (BDS)[2] standards for stormwater disposal. When BDS approved the project in 2002, the disposal standard for landscape facilities was to infiltrate at least 3 inches of runoff in 24 hours (approximately the size of the 10 year design storm). The design standard for the subsurface systems – the landscape systems that overflow to drywells and the sand filter/infiltration gallery - was to manage 3.8 inches in 24 hours (the size of the 25 year design storm). All design standards were current in 2002.

Construction - small infiltration planter with flume (note trench drain bringing roof runoff into planter); 2001

The Natural Resource Conservation Service (NRSC) Soil Survey for Multnomah County classifies the soils as type 52A - urban land/Multnomah complex. The survey assigns an expected infiltration rate of 0.6 to 2.0 in. per hour.

Geodesign, Inc. drilled seven borings near the site in 2000 for the proposed Lents Town Center Urban Renewal Project[3]. The borings varied in depth from 20 and 26 ft. below grade; none of them encountered evidence of groundwater. Geodesign conducted infiltration tests in five of the seven boreholes at 5 to 10 ft. below grade. The tests confirmed that the sub-surface soils drain well: just one of these falling-head tests had infiltration rates less than 30 in. per hour.

Excavated landscpe infiltration basin (note erosion and accumulation of sediment); 2001

[2] BDS is responsible for developing standards for stormwater disposal and inspecting projects to confirm compliance with those standards.
[3] Reported in Olson Engineering technical stormwater design report; project 6789, August 18, 2000.

II. Facility Components

(See site plan for details, page 7)

Infiltration Planter (NW corner of the building).

Catchment Area: 1595 sq. ft. of roof

Facility Footprint[4]: 100 sq. ft.

Internal Volume: 35 cu. ft.

Overflow: The planter overflows to a small drywell ("pipe well").

Capacity: The planter has a capacity that is approximately 40% of the internal volume of a standard eastside soakage trench [5] that would be necessary for a catchment of 1595 sq. ft. The soakage trench would have a footprint of 96 sq. ft. and an internal volume of 101 cu. ft.

Additional Information:

- The planter is recessed into the sidewalk near the building entrance. It is 22 ft. by 4 ft. and about 6 in. deep. It has a ponding depth of approximately 4 in.
- There is 18 in. of sandy loam lining the bottom.

Southwest infiltration basin just after planting; 2001

Southwest infiltration basin after a rain event; 2002

Linked System: Small Patio Planter, Two Landscape Infiltration Basins (South Side of Building)

Catchment Area: 10,306 sq. ft. of roof

Facility Footprint[4] *of the linked system*: 1,760 sq. ft.

Internal Volume: 500 cu. ft.

Overflow: If the linked system reaches capacity it will overflow to the sand filter/ infiltration gallery.

Capacity: The system has a volume that is almost double that of the standard eastside soakage[5] trench that would be needed for a catchment of 10,306 sq. ft. The soakage trench would have a footprint of 618 sq. ft. and an internal volume of 650 cu. ft.

Additional Information:

- The basins have 4:1 side slopes and a ponding depth of approximately 6 in. They have an overall depth of 12 in.
- Each basin receives roof runoff via subsurface piping.
- Both basins have approximately 18 in. of sandy loam in the bottom.
- The combination sand filter/infiltration gallery is approximately 15 ft long by 4 ft. wide by 5 ft. deep and buried 12 in. below the bottom of the middle infiltration basin.
- The sand filter is 18 in. thick, sandwiched between two layers of drain rock (18 in. of rock above and 27 in. of rock below).

Southwest infiltration basin; October 2004

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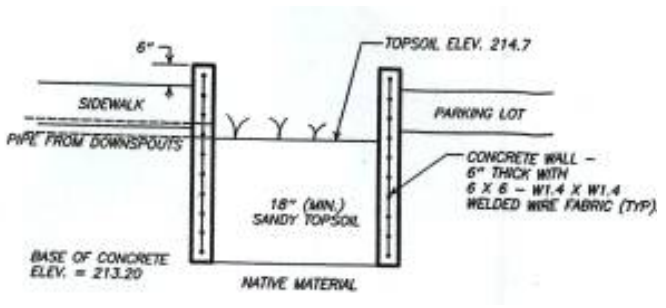
[4] For the purpose of comparing the capacity of the facility with the standard eastside soakage trench, the footprint has been calculated as the wetted (ponded) surface area when the facility reaches maximum capacity.

[5] The standard eastside soakage trench meets the City's standard for complete stormwater disposal in soils that infiltrate at least 2 in. per hour. The City requires 24 ft. of trench per 1000 sq. ft. of impervious area (drainage catchment). The trench is 3 ft deep, 2.5 f.t wide, and filled with drainage rock. Flow enters the trench through a pervious pipe that travels the length of the top of the trench. Assuming a porosity of 35%, the trench provides an internal volume of approximately 63 cu. ft. per 1,000 sq. ft. of catchment.

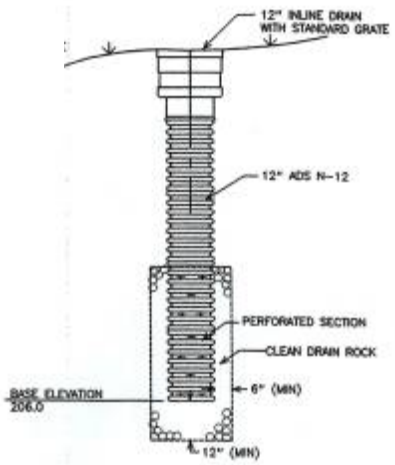
- The planter is recessed into the patio area at the building entrance. It is 5 ft. by 5 ft. and approximately 6 in. deep.



Cross section of patio planter

Landscape Infiltration Basin #3 (SE corner of the building).
Catchment Area: 2,120 sq. ft. of roof
Facility Footprint: 300 sq. ft.
Internal Volume: 75 cu. ft.
Overflow: Any overflow drains to a small drywell ("pipe well").
Capacity: The basin has an internal volume larger than a standard eastside soakage trench sized for the same catchment (the soakage trench would have a footprint of 126 sq. ft. and an internal volume of 132 cu. ft.).
Additional Information:

- The basin has 4:1 side slopes and a ponding depth of approximately 6 in. Its overall depth is 12 in.
- It receives roof runoff via subsurface downspout extensions.
- Approximately 18 in. of sandy loam line the bottom of the basin.



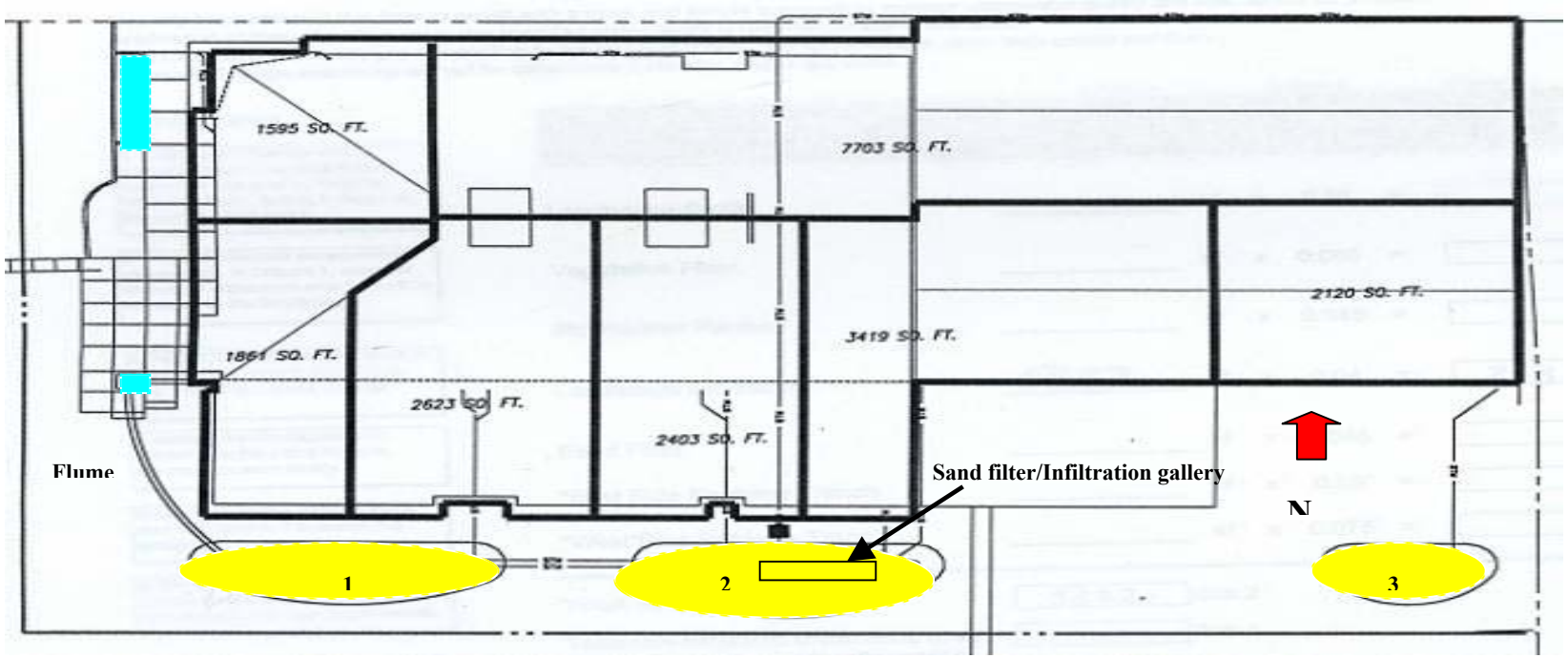
Schematic of pipe well

Small Drywells ("Pipe Wells")

- The large planter and infiltration basin #3 (SE corner building) are both fitted with identical small drywells.
- Each drywell is a 10-ft. section of 12 in. diameter pipe, sunk vertically. The pipe is corrugated ADS. The bottom 6 in. of the pipe is perforated and surrounded in drain rock.
- The top (inflow point) of each drywell stands 4-5 in. above the floor of the facility; a standard flat grate covers the top of the pipes.
- The drywells are not a standard design (but did not require a design appeal).

Landscaping
The vegetation in the landscape facilities, including the planters, is a combination of native and non-native varieties. A range of trees and shrubs surround the facilities, providing visual interest and shade. They also serve to deter access to the basins.

Irrigation system
A permanent irrigation system was installed to serve the new landscaped areas.



Site Plan of the Wattle's Boys and Girls Club indicating stormwater facility locations and roof catchment areas.

Stormwater Infiltration Planter **Landscape Infiltration Basin**

Budget

The final total budget submitted by the Club is $56,581. It does not include management and volunteer hours for planting the landscape. It includes costs for installing landscaping in areas that are not part of the stormwater facilities (see discussion following budget table).

Environmental Services contributed $30,000 in grant funds to the project. The final budget is shown below in Table 1.

Table 1. Wattles Boys and Girls Club Budget

Task Item	Item Cost	Total Cost	Volunteer Effort	% of Total Budget
Project Management		**?***		
Design		**$15,327**		27%
Architectural design	$3,666			
Engineering	$9,536			
Landscape design	$2,125			
Construction Management		?*		
Site Preparation and Construction		**$22,893**		40%
Landscaping		**$14,411**		25%
Plant Materials	$8,406			
Plant Installation	$1,000		**?***	
Irrigation	$5,005			
Miscellaneous		**$3,950**		7%
Permitting	$850			
Plumbing	$3,100			
TOTAL		**$56,581**		

* Costs for project and construction management were absorbed into the overall costs of the expansion and redevelopment project and are not available.
* Volunteer labor costs were not documented.

I. Budget Elements

Non-Construction Activities

The total cost for non-construction activities, including design and permitting, was $16,177, comprising 29% of the total budget.

- **Management**
  The final budget does not include an estimate for management costs; they were incorporated into the larger renovation project.

- **Design**
  The total cost for design was $15,327. This cost reflects the substantial engineering effort, particularly for the sand filter/infiltration gallery, and the architectural design of patio elements such as the stormwater flume. The relatively high design costs may also reflect the last-minute change orders required to add the stormwater management elements to a project that was already in progress.

- **Permitting**
  Permit costs were reported as $850.

Construction Activities

The cost of demolition, excavation, grading, construction, and landscaping was $40,404, comprising 71% of the total budget.

- **Site Preparation and Construction**
  These were reported together in the budget as a total of $22,893.

- **Landscaping**
  The cost of landscaping was $14,411. The plantings cost approximately $3.00 per sq. ft.; the irrigation system added about $1.70 per sq. ft. This is a relatively large proportion of the budget, although it does not account for installation by volunteer crews. The cost is not representative of the typical cost to landscape stormwater facilities – more than half of the areas included in the planting plan were outside the facilities.

- **Miscellaneous**
  Plumbing was a relatively small part of the budget at $3,100.

II. Cost Efficiencies

Management

The final budget does not include management costs for construction of the stormwater facilities. Those costs were absorbed into the management costs of the larger renovation project. There were likely substantial cost savings to implementing the project as part of the renovation project.

Mobilization
Staging and mobilization costs were probably minor since the stormwater project was part of a much larger expansion and renovation project.

Conveyance
An existing (unused) pipe in the foundation provided an easy option for conveying runoff from the north side of the building to the sand filter/infiltration gallery on the south side.

III. Cost Comparisons

This project includes simple landscape facilities that could be applied in many commercial retrofit projects. The project also includes more complex features, such as the architectural elements in the new patio, that were feasible as part of the larger renovation project.

The Boys and Girls Club summary budget is incomplete and requires adjustments in order to develop an estimated final budget. For cost comparison purposes, it is reasonable to increase the overall budget by 10% to account for the management and landscape installation activities. It is also valid to halve the listed landscaping costs (approximately $15,000) since the stormwater facilities comprise less than half the total area that was landscaped. With these adjustments, the overall cost is approximately $55,000.

Bidding and Permitting

I. Bidding Process

The Boys and Girls Club contracted with Anderson Construction Company for all phases of the expansion and renovation project, including the stormwater project. Anderson sub-contracted the excavation work to Moore Excavation, Inc.

II. Permits Required

Plumbing Permit
A separate plumbing permit was issued for the downspout disconnections, additional stormdrain pipe connections, and overflow devices (including the sand filter/infiltration gallery and the small drywells).

Commercial Building Permit
The City required a commercial building permit for the expansion and renovation project; the permit covered all construction, including the stormwater management facilities.

Site Development Permit
The City did not require a site development permit because the commercial building permit incorporated the range of reviews required for the entire renovation project (including the stormwater management facilities).

Planning and Zoning Review
Construction and implementation of the stormwater management facilities did not trigger requirements related to conditional uses, non-conforming uses, and overlay districts (trails, e-zones, plan districts, etc.).

Appeals
No permitting appeals were required for the stormwater facilities or related components.

III. Permitting Issues
There were no permitting issues to report.

Construction

Anderson Construction Company was the primary contractor for the project. Anderson began construction began in April 2001 and finished the work in November 2001.

Maintenance and Monitoring

The Boys and Girls Club owns the facility and is responsible for maintenance. Environmental Services will monitor the performance of the facilities at the Club for at least five years, and perhaps longer. Confirming the hydraulic performance of the facilities will be a primary focus. Environmental Services will also regularly evaluate the level of effort required to maintain the facility, the success of the planting regime, and comments from the owner.

Successes and Lessons Learned

Adaptive design – the design successfully incorporates a variety of infiltration technologies to achieve different aesthetic goals and adapt to space constraints. The patio planters and the flume are very effective visual enhancements to the buildings entrance.

Efficiencies – there were likely substantial efficiencies in the management of the stormwater project since it was integrated into a larger building expansion and renovation. Management costs were not reported in the budget summary.

Landscaping – The completed landscaping did not conform with the landscape plan as originally permitted and approved. This situation is not atypical, particularly for landscaping efforts conducted by volunteers. Some plants were subsequently moved to locations that provide better growing conditions, and plants were added post-construction to replace those that did not survive.