

UBC Social, Ecological Economic Development Studies (SEEDS) Student Report

**Scenic Streams Stormwater Management Cost-Benefit Analysis**

**Carolina Guimaraes, Rob Littlejohn**

**University of British Columbia**

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**Scenic Streams Stormwater Management Cost Benefit Analysis**

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# Scenic Streams Stormwater Management Cost Benefit Analysis

## Overview

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The main purpose of this interdisciplinary project is to seek a potentially cost effective stormwater solution for the south campus development. The idea is to utilize a stream concept that will ultimately sustain and enhance biodiversity, provide social amenity, be aesthetically valuable and inspire those who live in and visit the community.

This analysis will aid developers by providing them with evaluations of various techniques that will enable them to score higher on their adherence to REAP<sup>1</sup> (Residential Environment Assessment Program) guidelines without any significant financial setbacks, and will make their final product more marketable.

A presentation will be produced expressing the results of a thoughtful analysis of the costs and benefits of the canalization of the roof water from the South Campus housing to the constructed stream. The results will be compared to conventional stormwater systems consisting of ditches, gutters, culverts etc. This cost benefit analysis approach will incorporate full cost assessment and triple bottom line principles to generate a conclusion that will be most cost effective and beneficial for developers to pursue.

This stormwater management system has the potential to contribute to UBC's reputation as a leader in sustainability by adding social, ecological and economic value to the south campus development. Socially it will aid in the improvement of healthy indoor and outdoor environments, which in turn contributes to good overall health, and it will broaden the benefits of environmentally friendly living in the UBC Community. Moreover, this project has the potential to put UBC Policy #5: Sustainable Development into practice and it enhances the idea of UBC taking a leadership role among North American Universities and "walk[ing] the talk" of the Trek 2010 vision.<sup>2</sup> Ecologically the features of this project will reduce the negative impacts of storm water without marginalizing other aspects of the natural environment. Economically solid business cases will encourage developers to use innovative 'green features and technology'. These features can be used to market housing effectively and lead to good sales and increased endowment for the university and its constituents.

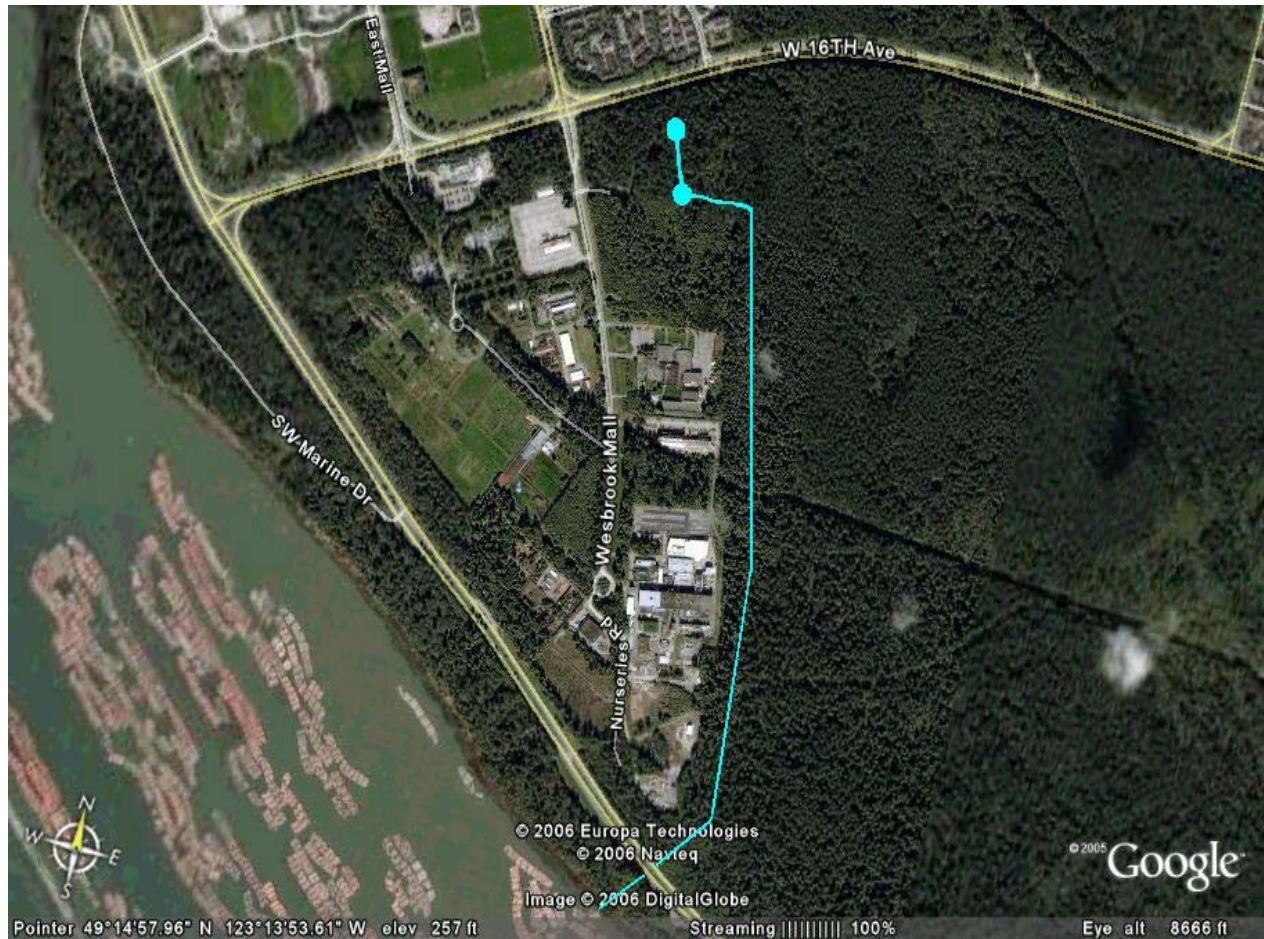
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<sup>1</sup> The REAP document presents ideas for more sustainable residential construction and building performance at UBC. It encourages sustainable design, water and energy efficiency, waste management, healthy interiors and use of innovative heating systems, local materials, high efficiency appliances and equipment that minimizes energy, water and waste.

<sup>2</sup> "The University of British Columbia, aspiring to be one of the world's best universities, will prepare students to become exceptional global citizens, promote the values of a civil and sustainable society, and conduct outstanding research to serve the people of British Columbia, Canada, and the World" Martha Piper, Trek, Summer 2005.

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## Approximate Stream Layout



# Scenic Streams Stormwater Management Cost Benefit Analysis

## Benefits of Stream System

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### 1. Less water running into culverts

Rainwater from roofs is relatively clean, and will be directed into the stream. Standard systems allow roof rainwater to mix with stormwater off roads, parking lots etc. that are contaminated with oil, salt, detergents etc. and then all of this washes into natural bodies of water. Treatment procedures are possible to clean the water, but the stream system would still be beneficial as it would decrease the burden and costs on treatment facilities.

Also, the stream would smooth the velocity of water, reducing the runoff velocity, thus helping on the prevention of erosion.

-Beneficiaries: the local environment

### 2. Possibility of Avoiding Spiral Drain

There has been discussion in regards to the possibility of having a spiral drain off South West Marine to keep stormwater of the creek. Besides being a costly project, approximately \$2,000,000, it will cause various controversies among the UBC Community. Thus, if enough water can be diverted or absorbed through other methods, the spiral drain can be avoided. The stream is one step towards accomplishing this goal.

### 3. Water Quality

An open stream system “Improves water quality by exposing water to air, sunlight, vegetation, and soil, all of which help transform, bind up, or otherwise neutralize pollutants” (Daylighting)

-Beneficiaries: area residents

Also, even if there is no aquatic life in the stream, the water that flows through the stream would carry nutrients to its ultimate destination, being beneficial to the ecosystem.

### 4. Creation of Wildlife (Particularly Fish) Habitat

The stream could be a spawning ground for cutthroat trout and possibly salmon. This would benefit commercial salmon stocks, and could be a benefit for DFO (who have been receiving bad publicity over declining salmon stocks) if they backed the project. This would also be of interest for local schoolchildren, as could be considered an outdoor laboratory.

-Beneficiaries: fisheries (DFO), schools

### 5. Aesthetics, Increase Property Values

Area landscaping is important in a neighbourhood, and potential homebuyers or renters will be more likely to purchase or rent a home if they find the surrounding area aesthetically pleasing. Having a stream through the neighbourhood is something that many will find to enhance the landscaping and make the area more beautiful. The stream can be a source of leisure and rest, where trails, benches and playground can be added along the stream, providing a recreational amenity for children. In addition, the

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stream could create a visually appealing natural border between Westbrook Place and Pacific Spirit Park (more information bellow).

-Beneficiaries: residents, developer, UBC Properties Trust

### **6. Promotion Value**

Building a stream system has the potential to be of value to UBC Properties and the chosen developers as it can be marketed as a green endeavor undertaken on their own initiative to make the area environmentally friendly and sustainable, thus reaching various audiences. The stream would create the opportunity for UBC to tell a good story, and be further recognized as a leader in sustainability practices. This is of particular merit due to the environmental/sustainable nature of the OCP, and the likely critical UBC population. Moreover, UBC, when compared to other nearby universities such as UVIC and SFU, appears to be moving slowly and not taking a leadership role when it comes to sustainability and innovative practices. For example: when one “googles” key terms such as holistic approach or stormwater, UBC does not show up in any of these searches, whereas SFU and UVIC do. Articles then explain how SFU has created a “Univercity” stormwater management plan, by implementing strong stormwater guidelines and ensuring a commitment to maintain pre-development water quality. UVIC also shows in the search as the University that in 2004 created an integrated stormwater management plan that includes underground water retention, permeable paving systems, roof top water detention, and vegetated bioswales. Therefore, it is UBC’s turn to “walk the talk” and take initiatives.

-Beneficiaries: developer, UBC Properties, UBC

### **7. Sense of Doing Things Right**

Feelings of pride and accomplishment can be derived from creating something that will be environmentally and ecologically beneficial into the future. The stream ties together the idea of a holistic approach where social, environmental and economical ideas are taken into consideration. The stream has the potential to reconnect people to nature through the look, feel and smell of open water and riparian vegetation and streamside creatures. The UBC Community will be able to pride itself on the creation of a stream system that helps reverse the effects that human habitation has had on the area, by minimizing the effects of urbanization.

-Beneficiaries: UBC Community

### **8. Creates Visually Appealing Border Between Westbrook Place and Pacific Spirit Park**

The stream will be located along the Pacific Spirit Park border of Westbrook Place, and will thus create a border that is much more visually appealing than a fence (which is probably the only alternative due to lack of light to grow a hedge).

### **9. Lower Cost Alternative to Green Roofs**

A stream system would almost certainly be cheaper than building green roofs on all of the subject buildings.

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## 10. REAP Compliance

Building a stream system would be beneficial to developers as it would help them gain two REAP optional design points for developing a stormwater management plan

### Conclusion

Besides the increase in property value, all the other benefits mentioned above are hard to quantify (positive externality), yet it does not mean they are less important. Overall, our aim is to show that stormwater, which many times is considered a nuisance can be turned into a beneficial resource for the environment and communities.

## Benefits of Standard System

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### 1. Tried and Tested

Standard stormwater systems offer less uncertainty as they are used throughout most developments, and thus have well proven attributes. Construction and maintenance crews are also more likely to be familiar with these systems, which will contribute to ease of implementation and upkeep.

-Beneficiaries: developer, UBC Properties, maintenance?

### 2. Out of Sight Out of Mind

Standard stormwater systems can, with the exception of regular maintenance, be built and then forgotten. They are underground, and thus out of sight to everyone, and they require no surface area.

- Beneficiaries: residents(?), planners, developer

### 3. Time-Faster Implementation

A standard stormwater system will be quicker to build than the stream system, which could be a significant benefit depending on development dates and timelines.

-Beneficiaries: UBC Properties, developer

### 4. No safety fears associated with open water

A standard stormwater system will not have open ponds or creeks that could lead to safety concerns for children.

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# Scenic Streams Stormwater Management Cost Benefit Analysis

## Costs of Stream System (see Appendix 1)

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### 1. Construction Costs

Cost Bearers-All construction costs are costs to developers unless donations or government funding are available.

### 2. Excavation costs

Building of the stream will require considerable excavation, making use first of machinery (backhoe or excavator), and then hand digging.

### 3. Materials Cost

Various materials will be used to construct the stream. These will include:

Gravel: both fine (4.75 – 19mm) and course (19 - 75mm)

Cobble: stones ranging in size from 0.075 – 0.35 m

Vegetation: grasses and any other bank and periphery vegetation desired

Piping: PVC pipes and related necessary materials (ie: glue) will be required to pipe the water from the base of the roof gutters to the 2 ponds at the head of the stream.

### 4. Labour Costs

Throughout the building and designing process, there will be extensive labour costs. Design costs have thus far been donated in kind by UBC faculty and students, but additional labour hours will be needed to build the stream. Furthermore, construction and maintenance crews, who would likely be unfamiliar with this type of system, would need to be instructed as to how to build or maintain a sustainable stream.

-Potential for Volunteers?

## Other/Indirect Costs

### 1. Land Cost

The stream will require land space that could otherwise be used for other purposes. The amount of surface area required will be approximately 3110 square meters for the stream itself, but extra area may be desirable on each side of the stream, greatly increasing the space needed.

- Cost Bearer: developers, and residents or other users of the land

### 2. Possible Fears of Safety

Although the only bodies of water over half a meter deep are the ponds, there is the possibility that parents will be concerned about the safety of small children.

- Cost Bearer: residents and other area users

### 3. Breeding Vermin

Some residents fear that living near a stream will increase the chances of pests such as bugs or rats.

- Cost Bearer: residents and other area users



# Scenic Streams Stormwater Management Cost Benefit Analysis

## 4. Marketing Costs

UBC properties would likely wish to market their green initiatives, which would require marketing expenses.

## Costs of Standard System

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The construction costs of the stream system are seen as additional or premium costs to any standard system costs, and the costs associated with building a standard system have thus not been analyzed.

## Concluding Remarks

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We believe this project is very important to the UBC Community, as it is engaging students, staff and faculty in an interesting and innovative hands-on project. If it is the students, faculty and other people within the UBC community who make UBC a rich and unique university, then the University has to take into account what these individuals think and feel about what is happening on campus. It is therefore vital for the University to find a middle ground between all its different interests and audiences.

We are aware that UBC has taken big strides over the past few years and is trying to take a leadership role in sustainability issues, in addition to motivating its students to be global citizens and think “outside of the box”. We feel that there are, however, still many steps to be taken and many obstacles to be overcome before this goal becomes reality. Many of these steps relate to how UBC develops its lands, and specifically what steps it takes in doing so to insure that they will be equally valuable to future generations. UBC has and must continue to “walk the talk”.

With regards to our project, it would have been interesting to have started this project during the early stages of development on South Campus. When we presented our final project to UBC Properties, they had similar ideas regarding the installations of ponds. On one hand, having their design like ours was an advantage to the potential implementation of our project, as they would not have to go very far beyond what they had already had in mind. However, on the other hand, we are concerned that they may settle for only parts of our project, as our whole project might not fit into their vision or plan of South Campus. One important reason could be that they already have engaged in decisions and steps towards some projects, and implementing a new idea (“ours”) could be costly and problematic.

Overall, we believe this project was very successful and we have reached our final objective: “give some food for thought to UBC Properties”. We are positive we had an impact on our audience, and that we made them think critically about our proposal. Hopefully, this project will be implemented on South campus and initiatives like this will continue to be encouraged on campus.