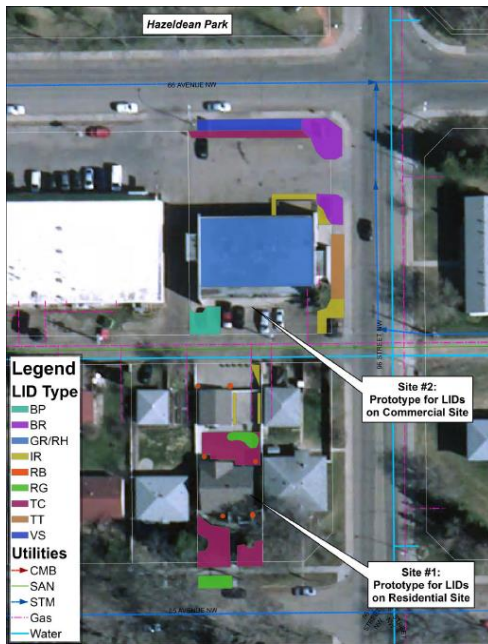


EOR and Autocase teamed to run a Triple Bottom Line Cost Benefit Analysis (TBL-CBA) on two prototype private sites and over 33,000 LID retrofit opportunities on public lands in Edmonton.

Challenge: For the City of Edmonton there are lots of combinations of potential sites and green stormwater features. But where to start?



Private Retrofit Prototype Sites

The City of Edmonton has identified Low Impact Development (LID) as a strategy to achieve their water quality target of no net increase in pollutants discharged to the North Saskatchewan River. Flood reduction is also a top priority for the City to limit flooding and to build long term resiliency into the drainage system.

Retrofitting the stormwater system is required in mature neighbourhoods built without controls and with storm sewers sized for small rainfall events. Two prototype private sites and a large set of public sites were analyzed. The cloud-based automated TBL-CBA software Autocase for Sites was used to estimate the incremental lifecycle costs and monetary value of the broader social and environmental impacts of LID retrofits on public and private lands.

The team assessed over 33,000 LID retrofit opportunities to prioritize the most cost-effective investments and estimate the holistic value of broad LID implementation across the city. Of

the significant net benefits of the LID retrofits, the greatest monetary benefits are provided by avoided grey infrastructure costs, followed by social benefits such as flood risk mitigation and property value uplift. Environmental benefits, such as air pollution reduction also contribute to the value of the investments.

While some of the more capital and O&M intensive LID practices are not as attractive for pay back, the lower cost options, such as rain barrels and land cover conversion to native prairie, offer roughly the same triple bottom line.

Two private LID retrofit scenarios were developed in order to address the following questions:

- Does LID implementation on private properties have a net financial benefit over its lifecycle?
- Which LID types provide the greatest NPV?

For the 33,000 public sites:

- Which sites provide the highest value?
- Which features contribute most to the triple bottom line?
- How many LID retrofits are needed to meet pollutant reduction targets?

Example Output for Rain Garden



| Impact Type | Cost/Benefit | Value | 95% Confidence Interval |
|----------------------|-------------------------------------|--|-------------------------|
| Financial | Other Benefits | \$521 | \$521 to \$521 |
| Financial | Residual Value of Assets | \$58 | \$18 to \$156 |
| Financial | Replacement Costs | -\$911 | -\$1,973 to -\$349 |
| Financial | Capital Expenditures | -\$1,256 | -\$2,626 to -\$486 |
| Financial | Operations and Maintenance | -\$10,897 | -\$21,628 to -\$2,147 |
| Social | Flood Risk | \$1,457 | \$651 to \$8,238 |
| Social | Property Value | \$475 | \$302 to \$634 |
| Social | Heat Island Effect | \$83 | \$51 to \$121 |
| Environmental | Air Pollution Reduced by Vegetation | \$360 | \$259 to \$489 |
| Environmental | Water Quality | \$173 | \$173 to \$173 |
| Environmental | Carbon Reduction by Vegetation | \$14 | \$6 to \$28 |
| Financial | | -\$12,485 | |
| Social | | \$2,015 | |
| Environmental | | \$547 | |
| | | Triple Bottom Line (before Avoided Costs) | |
| | | -\$9,922 | |

This analysis provided the opportunity for combining features to optimize the design to minimize lifecycle cost while maximizing the property value, urban heat island, air and water quality, carbon, and water quantity benefits.

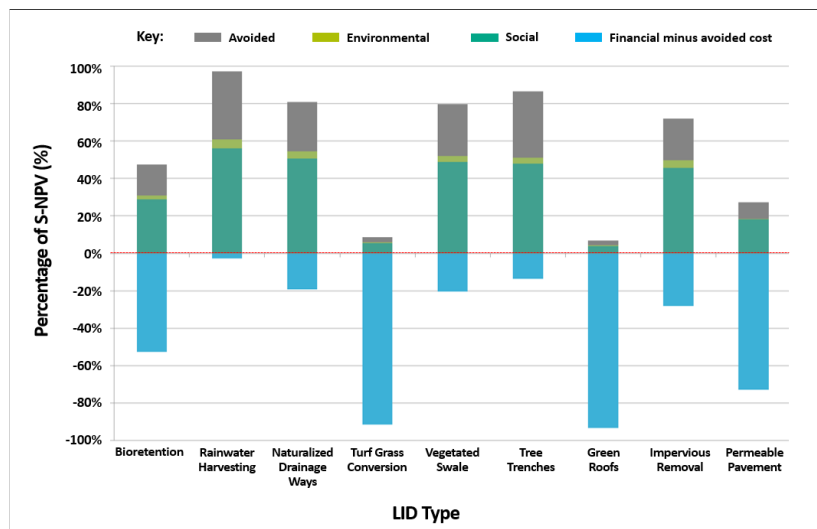
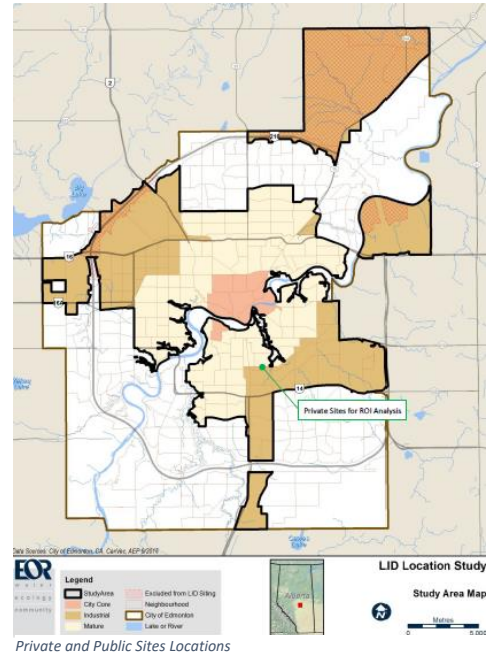
Solution: Autocase for Sites was modified to analyze thousands of potential sites at once.

Typically, it takes months to ascertain the size of these co-benefits, and it is only cost effective to do the analysis once a project is approved and is in the later stages of design. In this case, the software provided default local data for the early-stage designs and each site only took seconds to run in a batch-run version of Autocase for Sites.

Results: \$420 million net benefits over project life

Public LID retrofits offer significant cumulative holistic value with half of sites having benefits greater than costs. The results also show the ability to exceed the City’s short & medium-term pollution targets for the North Saskatchewan River.

Autocase results provided the City with the ability to prioritize LID implementation based on: TBL value, runoff and pollutant reductions, flooding area, or locations that are prime for redevelopment.



Cities, now more than ever, have to demonstrate the cost-effectiveness of their spending. Budgets do not allow every good project to be undertaken immediately so priorities are needed for promising initiatives.

In addition, stakeholders want to understand “what’s in it for me?” and need to be shown the triple bottom line for public spending.

Cities seeking to become more resilient now have a powerful

tool that enables them to prioritize sites and LID features. Watershed-level analysis of multiple sites can be run quickly with Autocase for Sites. Results can be evaluated based on their ability to meet flooding, water quality, lifecycle cost, or other benefit of cost categories.

With Autocase, EOR partnered with the economic professionals at Impact Infrastructure to provide the City of Edmonton with a batch-run version of Autocase for Sites.

Autocase: Making the business case for resilient green infrastructure



Autocase for Sites is a software tool that models the environmental and social dollar values of green infrastructure designs and, together with financial costs, evaluates their net, triple bottom line (TBL) benefit over the life of a project using a rigorous cost-benefit analysis (CBA) framework. With Autocase, the cost and time required to compare design alternatives at any stage of a project is a fraction of today’s custom studies. As a result, design firms can easily evaluate and justify different approaches and, in so doing, contribute to the future economic, social, and environmental success of every project.

For more information about how TBL-CBA would assist your resilience project, go to www.autocase.com